THE TURBEVILLE LIBRARY

TURBEVILLE BRANCH LIBRARY
CLARENDON COUNTY

TURBEVILLE, SOUTH CAROLINA

CONSTRUCTION DOCUMENTS

CRAIG GAULDEN DAVIS

Architecture Planning Interiors

PBK

DESIGN OFFICE: 19 Washington Park, Greenville, South Carolina 29601

August 29, 2025

CGD PROJECT NO.: 22067

This page intentionally left blank

TURBEVILLE BRANCH LIBRARY
CLARENDON COUNTY, SOUTH CAROLINA

CGD PROJECT NUMBER: 22067

DATE OF ISSUE: AUGUST 29, 2025

OWNER:
CLARENDON COUNTY ADMINISTRATION
411 Sunset Drive
Manning, South Carolina 29102
803-435-0135

ARCHITECT:
CRAIG GAULDEN DAVIS | PBK
19 Washington Park
Greenville, South Carolina 29601
864-242-0761

CIVIL ENGINEER:
STEWARD ENGINEERING
1416 Saugus Court
Chapin, South Carolina 29036
803-716-0772

STRUCTURAL ENGINEER:
PALMETTO STRUCTURAL ENGINEERING, LLC
104 Hunter Hill Circle
Six Mile, South Carolina 29682
264-436-8684

HVAC ENGINEER:
STEPHENS ENGINEERING & CONSULTING
130 Heritage Lane
Easley, South Carolina 29642
864-414-1965

ELECTRICAL ENGINEER:
BURDETTE ENGINEERING, INC.
200 Regent Park Court
Greenville, South Carolina 29607
864-297-8717

This page intentionally left blank

SECTION 00 01 02 - TABLE OF CONTENTS

GENERAL

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 00 00 - Cover Page
00 01 01 - Title Page
00 01 02 - Table of Contents
00 01 07.1 - Seals Page - Architect
00 01 07.2 - Seals Page - Civil
00 01 07.3 - Seals Page - Structural
00 01 07.4 - Seals Page - Mechanical and Plumbing
00 01 07.5 - Seals Page - Electrical
00 10 00 - Solicitation
00 21 13.0 - AIA Document A701 - 2018 Instructions to Bidders
00 21 13.1 - Supplemental Instructions to Bidders
00 31 32.0 - Geotechnical Data
00 31 32.1 - Geotechnical Report
00 41 01 - Bid Form - Stipulated Sum (Single Prime Contract)
00 41 03 - AIA Document A310 - 2010 Bid Bond
00 50 00 - AIA Document A312 - 2010 Performance Bond & Payment Bonds
00 71 00 - AIA A101 - 2017 Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*
00 72 00 - AIA A201 - 2017 General Conditions of the Contract for Construction

DIVISION 01 - GENERAL CONDITIONS

01 10 00 - Summary
01 21 00 - Allowances
01 22 00 - Unit Prices
01 23 00 - Alternates
01 26 00.0 - Contract Modification Procedures
01 29 00 - Payment Procedures
01 31 00 - Project Management and Coordination
01 32 00 - Construction Progress Documentation
01 33 00.0 - Submittal Procedures
01 33 00.1 - Digital Data Release Form
01 40 00 - Quality Requirements
01 41 00 - Regulatory Requirements
01 42 00 - References
01 42 16 - Definitions
01 50 00 - Temporary Facilities and Controls
01 56 00 - Temporary Barriers and Enclosures

01 56 39 - Temporary Tree and Plant Protection
01 57 00 - Soil Erosion Control
01 60 00.0 - Product Requirements
01 60 00.1 - Request for Substitution Form
01 73 00 - Execution
01 74 00 - Miscellaneous Work and Cleanup
01 74 13 - General Cleaning
01 74 19 - Construction Waste Management and Disposal
01 75 00 - Starting and Adjusting Systems
01 77 00 - Closeout Procedures
01 78 23 - Operation and Maintenance Data
01 78 30 - Warranties
01 78 39 - Project Record Documents
01 79 00 - Demonstration and Training

DIVISION 02 - EXISTING CONDITIONS

02 05 00 - Sitework - General Requirements
02 05 01 - Materials and Equipment
02 40 00 - Demolition

DIVISION 03 - CONCRETE

See Structural Drawings
03 05 10 - Cement Concrete
03 30 00 - Sidewalks, Driveways, and Curbs
03 30 00.1 - Cast-in-Place Concrete
03 35 00 - Concrete Floor Finishing
03 40 00 - Monolithic or Sectional Precast Structures

DIVISION 04 - MASONRY

See Structural Drawings
04 22 00 - Concrete Unit Masonry
04 42 00 - Exterior Stone Cladding
04 43 16 - Stone Fabrications

DIVISION 05 - METALS

See Structural Drawings
05 50 00 - Metal Fabrications
05 52 13 - Pipe and Tube Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

See Structural Drawings
06 10 00 - Rough Carpentry
06 10 53 - Miscellaneous Rough Carpentry
06 16 00 - Sheathing

06 41 13 - Wood-Veneer-Faced Architectural Cabinets
06 41 16 - Plastic-Laminate-Clad Architectural Cabinets
06 60 00 - Cellular PVC Fabrications

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 21 00 - Thermal Insulation
07 26 00 - Vapor Retarder
07 27 28 - Fluid-Applied Membrane Air Barrier
07 31 13 - Asphalt Shingles
07 41 13 - Standing Seam Metal Roof Panels
07 46 46 - Cement Board Siding
07 62 00 - Sheet Metal Flashing and Trim
07 92 00 - Joint Sealants

DIVISION 08 - OPENINGS

08 11 13 - Hollow Metal Doors and Frames
08 14 16 - Flush Wood Doors
08 41 13 - Aluminum-Framed Entrances and Storefronts
08 71 00 - Door Hardware
08 71 13 - Automatic Door Operators
08 80 00 - Glazing

DIVISION 09 - FINISHES

09 21 16 - Gypsum Board Assemblies
09 30 00 - Tiling
09 51 23 - Acoustical Ceiling Panels
09 65 00 - Resilient Flooring
09 68 13 - Tile Carpeting
09 91 13 - Exterior Painting
09 91 23 - Interior Painting

DIVISION 10 - SPECIALTIES

10 14 19 - Dimensional Letter Signage
10 14 23 - Panel Signage
10 28 00 - Toilet, Bath, and Laundry Accessories
10 44 00 - Fire Protection Specialties
10 75 00 - Flagpoles

DIVISION 11 - EQUIPMENT

11 31 00 - Residential Appliances

DIVISION 12 - FURNISHINGS

12 24 94 - Roller Window Shades
12 36 61.0 - Solid Surfacing Countertops
12 36 61.19 - Quartz Surfacing Countertops

DIVISION 21 - FIRE SUPPRESSION

21 00 00 - Fire Sprinkler System Specification Sheet

DIVISION 22 - PLUMBING

22 05 00 - Common Work Results for Plumbing

22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

22 05 53 - Identification for Plumbing Piping and Equipment

22 07 00 - Plumbing Insulation

22 11 16 - Domestic Water Piping

22 11 19 - Domestic Water Piping Specialties

22 13 16 - Sanitary Waste and Vent Piping

22 13 19 - Sanitary Waste Piping Specialties

22 33 00 - Electric Domestic Water Heaters

22 40 00 - Plumbing Fixtures

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

23 05 00 - Common Work Results for HVAC

23 05 29 - Hangers and Supports for HVAC Piping and Equipment

23 05 53 - Identification for HVAC Piping and Equipment

23 05 93 - Testing, Adjusting, and Balancing for HVAC

23 07 00 - HVAC Insulation

23 23 00 - Refrigerant Piping

23 31 13 - Metal Ducts

23 33 00 - Air Duct Accessories

23 34 23 - HVAC Power Ventilators

23 37 13 - Diffusers, Registers, and Grilles

23 81 26 - Split-System Air-Conditioners

DIVISION 26 - ELECTRICAL

26 05 00 - General Provisions

26 05 01 - Basic Materials

26 05 19 - Conductors

26 05 26 - Grounding

26 05 39 - Electrical Raceways

26 05 48 - Vibration and Seismic Controls for Electrical Systems

26 05 73.13 - Short-Circuit Studies

26 05 73.16 - Coordination Studies

26 05 73.19 - Arc-Flash Hazard Analysis

26 05 75 - Electrical Testing

26 26 00 - Service and Distribution

26 51 00 - Lighting

DIVISION 27 - COMMUNICATIONS

27 05 00 - Telecommunications Raceway System

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 46 21.11 - Addressable Fire Alarm Systems

DIVISION 31 - EARTHWORK

31 10 00 - Site Clearing

31 23 16 - Excavation - Earth and Rock

31 23 23 - Backfilling

31 31 00 - Soil Treatment

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 12 00 - Hot-Mix Asphalt Paving

32 92 00 - Lawn Restoration

DIVISION 33 - UTILITIES

33 06 00 - High-Density Polyethylene Pipe and Fittings

33 10 00 - Water Distribution Systems

33 30 00 - Sanitary Sewer and Gravity Systems

END OF SECTION

This page intentionally left blank

SECTION 00 01 07.1 - SEALS PAGE - ARCHITECT

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - ARCHITECT OF RECORD

Name and South Carolina License No.: David L. Dixon, 3944

Firm Name: Craig Gaulden and Davis, LLC / PBK Architecture

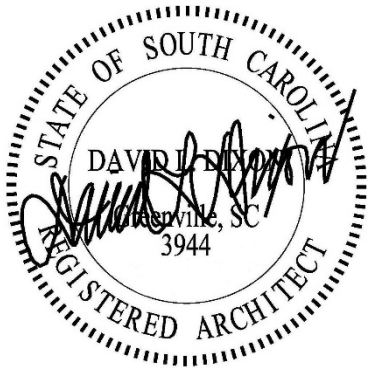
South Carolina Registered Firm License No.: B74013

Firm Address:

19 Washington Park

Greenville, South Carolina 29601

Divisions 1 - 12 Sections except where indicated as prepared by other design professionals of record.



PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

This page intentionally left blank

SECTION 00 01 07.2 - SEALS PAGE - CIVIL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - CIVIL ENGINEER OF RECORD

Name and South Carolina License No.: 37811

Firm Name: Steward Engineering

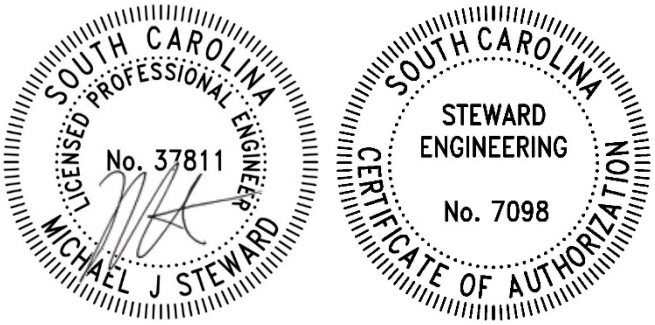
South Carolina Registered Engineering Firm License No.: 7098

Firm Address:

1416 Saugus Court

Chapin, South Carolina 29036

Division 1: General Requirements
(01 57 00 and 01 74 00)
Division 2: Site Work
Division 3: Concrete
Division 31: Earthwork
Division 32: Exterior Improvements and
Division 33: Utilities
Sections except where indicated as prepared by other design professionals of record.



INSERT PROFESSIONAL SEALS ABOVE

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

This page intentionally left blank

SECTION 00 01 07.3 - SEALS PAGE - STRUCTURAL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - STRUCTURAL ENGINEER OF RECORD

Name and South Carolina License No.: Matthew Ryan Summey, P.E., # 21980

Firm Name: Palmetto Structural Engineering

South Carolina Registered Engineering Firm License No.: 4761

Firm Address:

104 Hunter Hill Circle

Six Mile, South Carolina 29682

Divisions 3, 4, 5, and 6 Sections except where indicated as prepared by other design professionals of record.

INSERT PROFESSIONAL SEAL ABOVE

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

This page intentionally left blank

SECTION 00 01 07.4 - SEALS PAGE - HVAC

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - HVAC ENGINEER OF RECORD

Name and South Carolina License No.:

Firm Name: Stephens Engineering & Consulting

South Carolina Registered Engineering Firm License No.: 18685

Firm Address:

130 Heritage Lane

Easley, South Carolina 29642

Divisions 21, 22, 23 Sections except where indicated as prepared by other design professionals of record.

INSERT PROFESSIONAL SEAL ABOVE

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

This page intentionally left blank

SECTION 00 01 07.5 - SEALS PAGE - ELECTRICAL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - ELECTRICAL ENGINEER OF RECORD

Name and South Carolina License No.: Larry C. Mahaffey, PE SC Lic #15549

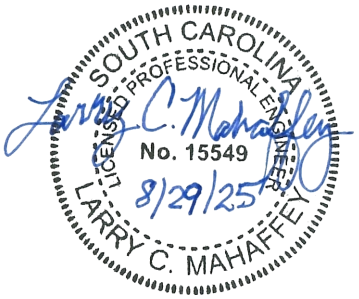
Firm Name: Burdette Engineering, Inc.

South Carolina Registered Engineering Firm License No.: C00495

Firm Address:

200 Regent Park Court
Greenville, South Carolina 29607

Divisions 26, 27, and 28 Sections except where indicated as prepared by other design professionals of record.

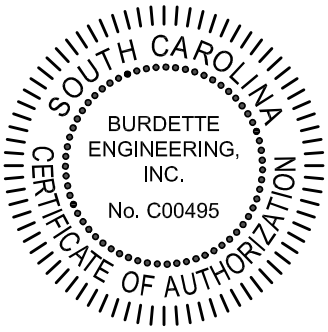


INSERT PROFESSIONAL SEAL ABOVE

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION



This page intentionally left blank

ADVERTISEMENT FOR BIDS
TURBEVILLE BRANCH LIBRARY

The County of Clarendon will receive sealed bids until 2:00 PM, local time, on October 2, 2025, at the Clarendon County Procurement Office, 3 South Church Street, Manning, South Carolina 29102 for The Turbeville Branch Library, Turbeville, South Carolina. At this time and place all bids received will be publicly opened and read aloud. A "Bid Guaranty" of not less than Five (5%) percent of the Base Bid is required.

A Non-Mandatory Pre-Bid Conference is scheduled for September 16, 2025, at 11:00 AM, at the new Turbeville Fire Station, 5164 Turbeville Highway, Manning, South Carolina 29102. While attendance is not mandatory, your participation is recommended.

Drawings and specifications for the project were prepared by Craig Gaulden Davis, LLC | PBK Architecture, 19 Washington Park, Greenville, South Carolina 29601 (Tel: 864-242-0761). General Contractors licensed to do business in the State of South Carolina may obtain sets of bid documents through the Clarendon County Procurement Department via https://clarendoncountyprocurement.sc.gov/solicitations Bidders must obtain bidding Documents/Plans from the above listed source(s) and request to be listed as an official plan holder by contacting Jeffrey A Hyde, Clarendon County Procurement Director at jhyde@clarendoncountygov.org. Only those bidding documents / plans obtained from the source(s) are official. Bidders that rely on copies of bidding documents / plans obtained from any other source do so at their own risk.

To be eligible for consideration, bids must comply with the laws of the State of South Carolina and the Procurement Code of Clarendon County, South Carolina. Bids will be required to remain open for acceptance or rejection by the Owner for thirty (30) days after the bid opening date. All other instructions concerning submission of a bid will be found in the "Instructions to Bidders", which is a part of the Contract Documents.

This page intentionally left blank

DRAFT

AIA® Document A701® – 2018

Instructions to Bidders

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

«Turbeville Library »
«Turbeville, South Carolina »
«
Construction of a one-story public library for the Town of Turbeville in Clarendon County, South Carolina. Project location is 1178 Smith Street, Turbeville, South Carolina 29162 »

THE OWNER:
(Name, legal status, address, and other information)

«Clarendon County Administration »« »
«411 Sunset Drive »
«Manning, South Carolina 29102 »
«(803) 435-0135 »

THE ARCHITECT:
(Name, legal status, address, and other information)

«Craig Gaulden and Davis, LLC | PBK Architecture »« »
«19 Washington Park »
«Greenville, South Carolina 29601 »
«(864) 242-0761 »

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

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

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

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

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

«https://clarendoncountyprocurement.sc.gov/solicitations

Or

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

www.bidnetdirect.com//clarendoncounty »

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

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

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

«All communications shall be by eMail to project@clarendoncountygov.org »

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

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

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

~~«~~«https://clarendoncountyprocurement.sc.gov/solicitations

Or

www.bidnetdirect.com//clarendoncounty »

»

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than seven (7) ~~four~~ days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

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

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

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

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

«Five percent (5%) »

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning« sixty (60)- »days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

«Clarendon County Procurement
3 South Church Street This is the Voter Registration and Elections Building
Manning, South Carolina 29102 »

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

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

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

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Procurement Director ~~Architect~~ of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

«Bid Security shall be returned »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

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

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

« »

§ 7.2 Time of Delivery and Form of Bonds

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

« »

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

« »

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

« »

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

« »

.5 Drawings

Number	Title	Date
TBD		

.6 Specifications

Section	Title	Date	Pages
TBD			

.7 Addenda:

Number	Date	Pages
TBD		

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

« »

AIA Document A701® – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, "A701," and "AIA Contract Documents" are registered trademarks and may not be used without permission. This draft was produced by AIA software at 10:56:56 ET on 02/03/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.
User Notes: (1999333176)

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

FORM OF INSTRUCTIONS TO BIDDERS

Reference *AIA Document A701-2018, Instructions to Bidders* bound in the Project Manual.

These Supplemental Instructions to Bidders amend or supplement The Instructions to Bidders (*AIA Document A701-2018*) and other provisions of the Bidding Documents and Contract Documents as indicated below.

All provisions of the Instruction to Bidders (*AIA Document A701-2018*) which are not so amended or supplemented shall remain in full force and effect.

Bidders shall examine the Bidding and Contract Documents for additional instructions or requirements.

MODIFICATIONS TO A701-2018

ARTICLE 2 BIDDERS REPRESENTATIONS

Add the following sentence to paragraph:

2.1.3 The Bidder by having visited the site has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents and has accepted the full responsibility for any pre-bid existing conditions that would affect the costs and could have been ascertained by a site visit.

2.1.7 The Workplace shall be maintained drug-free in accordance with applicable laws.

2.2 Attendance at the Pre-Bid Conference is recommended. Prospective Bidders are encouraged to be present at the Pre-Bid Conference at the specified time and place.

ARTICLE 3 BIDDING DOCUMENTS

Delete paragraph 3.1.1 and substitute the following:

3.1.1 Bidders may obtain complete sets of Bidding Documents electronically from the issuing office designated in the Advertisement or Invitation to Bid. Bidders shall not rely on documents from other sources other than those listed in the Advertisement or Invitation for Bids. No digital (CAD) documents will be issued by the Architect or the Architect's Consultants during the bidding phase.

Delete paragraph 3.1.3 and substitute the following:

3.1.3 Bidders and Sub-bidders shall use complete sets of the Bidding Documents in preparing Bids or sub-bids; Neither the Owner nor the Architect assumes responsibility for errors or misinterpretations resulting from the Bidders use of incomplete sets of Bidding Documents. Partial sets of Bidding Documents will not be issued.

Add the following paragraph:

3.1.5 Addenda will only be posted to the designated sources listed in the Advertisement or Invitation for Bids. It shall be the responsibility of the Bidder to ensure that they have received all addenda issued for the project.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

Add the following sentence to paragraph 3.2.3

No oral interpretation of Bidding Documents or oral instructions will be given prior to the award of the Contract.

3.3 SUBSTITUTIONS

Delete the first sentence in paragraph 3.3.2 and substitute the following paragraph:

3.3.2 No substitution will be considered prior to the receipt of Bids unless the Architect's Proposed Substitution Request Form has been fully completed, signed by one of the Prime Contractors bidding the work and submitted to the Architect for review and disposition at least ten days prior to the date for receipt of Bids. Forms that contain incomplete information or that are unsigned will not be considered for approval. Substitutions that are approved for use on the project will be issued by Addendum.

3.4 ADDENDA

Add the following paragraph:

ARTICLE 4 BIDDING PROCEDURES

Add the following sentence to paragraph 4.1.1:

4.1.1 The Bidder shall make no stipulations or qualify its Bid in any manner not permitted on the Bid Form. Qualified bids shall be deemed non-responsive.

Add the following paragraph:

4.1.8 Unsigned Bids shall be rejected: provided however, that an unsigned Bid shall not be rejected when it is accompanied by a properly prepared Bid Security or by other material indicating the Bidder's intention to be bound by the unsigned document, such as the submission of a Bid Guarantee with the Bid or a letter with the Bid signed by the Bidder, referring to and identifying the Bid itself. Bids that are conditional, illegible, obscure, contain mathematical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be rejected.

5.3 ACCEPTANCE OF BID (AWARD)

Add the following paragraph:

5.3.3 It is the intent of the Owner to award a Contract to the lowest evaluated responsive bid submitted by a qualified, responsible Bidder. The Owner reserves the right to conduct discussions with apparent responsive Bidders for the purpose of clarification to assure a full understanding of the requirements of the Invitation for Bid.

END OF SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

SECTION 00 31 32.0 - GEOTECHNICAL DATA

PART 1 GENERAL

1.1 GEOTECHNICAL DATA

A. This document provides Owner's information for Bidders' convenience and is not meant to supplement the Bidders' own investigations. The attachment is made available for Bidders' information only.

B. The subsurface soil investigation is to determine the nature of the soil below the natural grade has been made at various locations on the site. Test borings indicate only the soil conditions at the points where samples were taken and are not intended to indicate the soil conditions for the entire site.

C. Data on indicated subsurface conditions is not intended as representations or warranties of accuracy or continuity of such soil conditions between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by Bidders.

D. Test boring and exploratory operations may be made by the Contractor at no additional cost to the Owner.

E. The complete soil investigation data report is made available for the convenience of the Contractor only and is included herewith as follows:

Report of the Geotechnical Investigation prepared by:

ECS Southeast, LLP
5935 Rivers Avenue, Suite 105A
North Charleston, SC 29406
Phone: 843-654-4448

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

(NOT APPLICABLE)

END OF SECTION

This page intentionally left blank

ECS Southeast, LLP

Geotechnical Engineering Report

Turbeville Library

Gamble Street & Main Street
Turbeville, South Carolina 29162
Clarendon County GIS PIN Nos. 316-09-06-001, 316-09-06-002, 316-09-06-003, and 316-09-06-004

ECS Project Number 34:4590

August 21, 2023

August 21, 2023

Ms. Susan R. MacRae
Alliance Consulting Engineers, Inc.
PO Box 8147
Columbia, South Carolina 29202

Reference: Geotechnical Engineering Report
Turbeville Library
Gamble Street & Main Street
Clarendon County GIS PIN Nos. 316-09-06-001, 316-09-06-002, 316-09-06-003, and 316-09-06-004

ECS Project Number 34:4590

Dear Ms. MacRae:

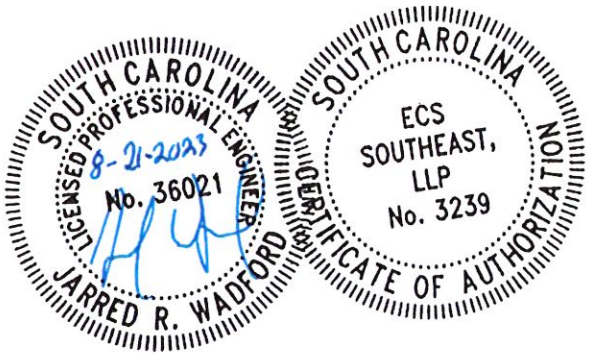
ECS Southeast, LLP (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 34:5488-GP, dated May 24, 2023. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and engineering analyses conducted and our recommendations for design and construction of geotechnical related items.

It has been our pleasure to be of service to you during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLP

Ashton Guest, E.I.T.
Geotechnical Staff Project Manager



Winslow Goins, P.E.
Principal Engineer

Jarred Wadford, P.E.
Office Manager

TABLE OF CONTENTS

EXECUTIVE SUMMARY **1**
1.0 INTRODUCTION **2**
2.0 PROJECT INFORMATION **3**
2.1 PROJECT LOCATION 3
2.2 CURRENT SITE CONDITIONS 3
2.3 PROPOSED CONSTRUCTION 3
3.0 FIELD EXPLORATION AND LABORATORY TESTING **4**
3.1.1 Cone Penetration Testing (CPT) Soundings 4
3.1.2 Kessler Dynamic Cone Penetrometer Testing (KDCP) 4
3.1.3 Hand Auger Borings 4
3.2 LABORATORY TESTING 4
3.3 REGIONAL/SITE GEOLOGY 5
3.4 SUBSURFACE CHARACTERIZATION 5
3.5 GROUNDWATER OBSERVATIONS 5
4.0 DESIGN RECOMMENDATIONS **6**
4.1 GENERAL 6
4.2 SEISMIC DESIGN CONSIDERATIONS 6
4.2.1 Liquefaction 6
4.2.2 Seismic Site Classification 7
4.2.3 Ground Motion Parameters 7
4.3 SHALLOW FOUNDATION RECOMMENDATIONS 8
4.4 SLABS-ON-GRADE 9
4.5 PAVEMENT DESIGN CONSIDERATIONS 10
4.6 SITE DRAINAGE 11
5.0 SITE CONSTRUCTION RECOMMENDATIONS **12**
5.1 SUBGRADE PREPARATION 12
5.1.1 Demolition, Stripping and Grubbing 12
5.1.2 Risk Associated with Undocumented Fill 12
5.1.3 Proofrolling 12
5.1.4 Site Temporary Dewatering 13
5.2 EARTHWORK OPERATIONS 13
5.2.1 Structural Fill 13
5.2.2 On-Site Borrow Suitability 14
5.2.3 Foundation And Slab Observations 15
5.3 GENERAL CONSTRUCTION CONSIDERATIONS 15
6.0 CLOSING **16**

APPENDICES

APPENDIX A – Drawings & Reports

- Site Location Diagram
- Test Location Diagram

APPENDIX B – Field Operations

- Reference Notes for Cone Penetration Test (CPT) Soundings
- Subsurface Exploration Procedure: Cone Penetration Testing (CPT) ASTM D 5778
- CPT Logs (C-01 to C-02)
- Reference Notes for Boring Logs
- Subsurface Exploration Procedure: Hand Auger Boring ASTM D1452
- Hand Auger Boring Logs (C-01, C-02, and K-01 to K-03)
- Subsurface Exploration Procedure: Kessler Dynamic Cone Penetrometer (DCP) ASTM D6951
- KDCP Test Data (K-01 to K-03)

APPENDIX C – Laboratory Testing

- Laboratory Testing Summary

APPENDIX D – Miscellaneous

- Important Information about your Geotechnical Report

EXECUTIVE SUMMARY

ECS Southeast, LLP (ECS) has completed the subsurface exploration for the proposed development to be located at the intersection of Gamble Street and Main Street in Turbeville, South Carolina. This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from this executive summary should not be utilized in lieu of reading the geotechnical report. Our findings, conclusions, and recommendations are summarized below.

SUBSURFACE CONDITIONS:

- Coastal Sedimentary Deposits: Observed to the maximum depth explored of approximately 40 feet below the current site grades.
- Groundwater: Observed at a depth of approximately 6.8 feet below current site grades within the CPT soundings. Groundwater was not encountered within the hand auger borings at the time of our exploration.

GEOTECHNICAL CONCERNS:

- Liquefaction Settlement from the design seismic event: In the range of up to 2 inches.
- Due to the developed nature of the site, undocumented fill and/or buried debris may be present at unexplored areas of the site.

DESIGN & CONSTRUCTION RECOMMENDATIONS:

- Seismic Design: Site Class "D."
- Shallow Foundations: 2,000 psf allowable bearing capacity.
- Slabs-on-Grade: Modulus of Subgrade Reaction, k = 175 pci

Details of our conclusions and recommendations are discussed in the report text. Should the proposed project features be changed from those described above, ECS must be consulted in order to verify that the recommendations made in this report are still valid.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design and construction of the proposed library at the intersection of Gamble Street and Main Street in Turbeville, South Carolina. The recommendations developed for this report are based on the results of our subsurface exploration, laboratory testing, and project information supplied by Alliance Consulting Engineers, Inc.

Our services were provided in accordance with our Proposal No. 34:5488-GP, dated May 24, 2023, as authorized by Alliance Consulting Engineers, Inc.

This report contains the results of our subsurface exploration, site characterization, engineering analyses, and recommendations for the design and construction of the planned structures and pavements.

The report includes the following items.

- Description of subsurface exploration program and test location plan.
- Description of tests performed, results of tests and data collected.
- Cone Penetration Test (CPT) sounding and hand auger boring logs and soil classification in accordance with Unified Soil Classification System.
- Pertinent geological data and general description of area soils.
- Site seismic considerations in accordance with the 2021 International Building Code (IBC 2021), including site liquefaction analysis.
- Shallow foundation recommendations.
- Considerations for subgrade modulus for design of at-grade slabs.
- Pavement recommendations.
- Constructability considerations including concerns with existing fill soils, subgrade preparation, dewatering, fill placement and compaction requirements, and suitability of site soils for use as structural fill.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located at the intersection of Gamble Street and Main Street in Turbeville, South Carolina, as shown below and on Figure 1 in Appendix A. The site is further identified on the Clarendon County GIS online mapping as PID Nos. 316-09-06-001, 316-09-06-002, 316-09-06-003, and 316-09-06-004.

2.2 CURRENT SITE CONDITIONS

At the time of our field exploration, the majority of the site was a cleared park. The southeast portion was developed with a memorial, a municipal building, and an outdoor gazebo. Site specific topographic information was not available at the time of this report; however, at the time of our site visit the site appeared to be relatively flat.

2.3 PROPOSED CONSTRUCTION

According to conversations and correspondence with Alliance Consulting Engineers, Inc, the following information explains our understanding of the planned structure, including proposed building and related infrastructure:

DESIGN ASSUMPTIONS	
SUBJECT	**DESIGN INFORMATION / ASSUMPTIONS**
Number of Stories	Single Story
Structural Loading	Column: 50 kips or less (assumed) Wall: 3 klf or less (assumed)
Usage	Library
Finished Floor Elevation	Up to 2 feet(assumed)

Site improvements include new asphalt parking/driving lanes, and entrances/exits to Main Street, Gamble Street, Green Street, and Smith Street.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field data to assist in the evaluation of geotechnical recommendations for design and construction for the project.

The test locations were identified in the field by ECS personnel using GPS techniques and are shown on the Test Location Diagram in Appendix A.

3.1.1 Cone Penetration Testing (CPT) Soundings

Two (2) CPT Soundings, designated C-01 and C-02, were performed in the general area of the proposed building footprint during our field exploration. The CPT soundings were performed in general conformance with ASTM D 5778 by our subcontractor. The soundings were performed with a track mounted rig. The CPT sounding logs and an explanation of our exploration procedures are presented in Appendix B.

3.1.2 Kessler Dynamic Cone Penetrometer Testing (KDCP)

Three (3) Kessler DCPs, designated K-01 to K-03 were performed in the general area of proposed pavements during our field exploration. The KDCP tests were conducted in general conformance with ASTM D6951. The Kessler DCP logs and an explanation of our exploration procedures are presented in Appendix B.

3.1.3 Hand Auger Borings

Five (5) hand auger borings, designated C-01, C-02, and K-01 to K-03 were performed adjacent to the CPT soundings and KDCPs. The hand auger borings were conducted in general conformance with ASTM D1452. The hand auger boring logs and an explanation of our exploration procedures are presented in Appendix B.

3.2 LABORATORY TESTING

The soil samples collected from the field exploration program were reexamined in our North Charleston office for soil classification and representative samples were selected for laboratory testing. The laboratory testing program was designed to evaluate the index properties of the soil at the site. Samples were tested to measure moisture content, Atterberg limits, and percent finer than the 200 sieve, where appropriate.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the hand auger boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual. Results of the laboratory testing are presented in Appendix C.

3.3 REGIONAL/SITE GEOLOGY

Due to the developed nature of the site, the natural geology of the site has been modified.

The site is located in the Bear Bluff formation of the Coastal Plain Physiographic Province of South Carolina. The Coastal Plain is composed of seven terraces, each representing a former level of the Atlantic Ocean. Soils in this area generally consist of sedimentary materials transported from other areas by the ocean or rivers. These deposits vary in thickness from a thin veneer along the western edge of the region to more than 10,000 feet near the coast. The sedimentary deposits of the Coastal Plain rest upon consolidated rocks similar to those underlying the adjacent Piedmont Physiographic Province. In general, shallow unconfined groundwater movement within the overlying soils is largely controlled by topographic gradients. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation.

3.4 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil strata encountered during our subsurface exploration. For subsurface information at a specific location, refer to the boring logs in Appendix B.

GENERAL SUBSURFACE STRATIGRAPHY			
Approximate Depth Range (ft)	**Stratum**	**Description**	**Estimated Ranges of CPT N-values (bpf)**
0 to 0.5	N/A	Approximately up to 6 inches of topsoil was encountered within the hand auger borings.	N/A
0.5 to 36	I	Very loose to very dense SAND (SP, SM, SC) with varying amounts of silt and clay, interbedded layers of CLAY with varying amounts of sand and silt (CL), moist to saturated	3 to 38
36 to 40	II	Soft to very stiff CLAY with varying amounts of silt and sand (CL), moist to saturated	4 to 10

3.5 GROUNDWATER OBSERVATIONS

Groundwater depths were measured in our CPT soundings and hand auger borings as noted on the logs in Appendix B. The groundwater depths were measured at approximately 6.8 feet below ground surface during the time of our field exploration at the CPT locations. Groundwater was not encountered within the hand auger borings at the time of our field exploration.

Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

4.0 DESIGN RECOMMENDATIONS

4.1 GENERAL

The primary purpose of this geotechnical exploration was to help identify and evaluate the general subsurface conditions relative to the proposed construction. Our recommendations have been developed on the basis of the previously described project information and subsurface conditions identified during this study.

4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 Liquefaction

When saturated soil with little to no cohesion liquefies during a major earthquake, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, differential settlement, loss of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction.

We completed a liquefaction analysis in accordance with the 2021 International Building Code (IBC) design earthquake[1]. Layers of loose to medium dense saturated sand and silty sand were encountered below the groundwater table to a depth of approximately 36 feet below the existing ground surface. ECS has compared the cyclic stress in these saturated soils to the cyclic resistance to estimate a Factor of Safety Against Liquefaction (FSAL).[2] On the basis of the results of our analyses, we conclude several of these layers have the potential to liquefy during the design seismic event.

Although the FSAL represents the liquefaction resistance of a soil stratum at a specific depth in a soil profile and are used in evaluating liquefaction-induced settlements, it does not quantify the severity of liquefaction-induced settlements or potential infrastructure damage for a site. Iwasaki et al. (1978) proposed the liquefaction potential index (LPI), which expresses liquefaction potential over an entire soil profile by integrating the product of the liquefaction potential of liquefiable soil layers and a weighting factor with respect to depth to the center of each liquefiable layer.

LPI is an empirical tool used to assess site liquefaction hazards and potential for liquefaction-related damage that ranges from 0 to 100. An LPI less than 5 indicates no anticipation of surface manifestations and low to moderate liquefaction-induced damages, LPIs ranging from 5 to 15 indicates surface manifestations and a high degree of liquefaction-induced damages are possible,

---

1 The IBC design earthquake has a 2% probability of exceedance in 50 years. Our liquefaction analysis was based on an earthquake with a magnitude of 7.3 and ground surface acceleration of 0.323 g.

2 Analysis completed following the procedures presented in the 1996 NCEER and the 1998 NCEER/NSF workshops on the Evaluation of Liquefaction Resistance of Soils (Youd and Idriss 2001). To estimate volumetric strain and associated liquefaction-induced settlement, we used the procedures developed by Zhang et al. (2002) and a depth weighting factor proposed by Cetin (2009).

and an LPI greater than 15 indicates probable surface manifestations with severe liquefaction-induced damages and that foundation damage is likely.

The LPI estimated for this site ranged between approximately 2 to 7, which indicates a high risk of surface manifestations, and a high degree of liquefaction-induced damages are possible during and immediately following the design seismic event. When soils susceptible to liquefaction are located within approximately 10 feet of the surface, ground surface disruptions (i.e., sand boils) are possible. Such disruptions beneath at-grade structures would result in bearing capacity failure. Since potentially liquefiable sands are located in the upper 10 feet at this site, there is a risk of ground surface disruption.

Our analysis indicates that at-grade structures such as parking, slabs and shallow foundations could potentially settle on the order of up to 2 inches during and immediately following the design seismic event. Differential settlement associated with liquefaction-induced settlement is expected to be approximately 50 to 100 percent of the overall anticipated liquefaction settlement. This settlement would result from volumetric compression of the liquefiable sand layers which occurs as seismically-induced excess soil pore water pressures dissipate.

Liquefaction Mitigation: If risks associated with liquefaction are not acceptable or the proposed structure cannot be designed to accommodate the anticipated liquefaction induced settlement without suffering catastrophic failure, ground improvement techniques may be required. If it is evaluated that ground improvement will likely be implemented, ECS should be contacted to discuss.

4.2.2 Seismic Site Classification

Section 1613 of the IBC 2021 and Section 20.3 of ASCE 7-16 classifies sites with the potential for liquefaction as Seismic Site Class F. However, Section 20.3 of ASCE 7-16 also allows the design spectral response accelerations for a site to be evaluated without regard to liquefaction provided structures have a fundamental period of less than or equal to 0.5 seconds and the risks of liquefaction are considered in design. Based on our past experience, the proposed building types should meet this criterion; however, this must be confirmed by the structural engineer.

Based on the results of the CPT soundings and our knowledge of local geologic conditions, it is our interpretation the site may be considered a **Seismic Site Classification "D,"** in accordance with the IBC 2021.

The Site Class definition should not be confused with the Seismic Design Category designation, which the structural engineer typically assesses.

4.2.3 Ground Motion Parameters

In addition to the seismic site classification noted above, ECS has provided the design spectral response acceleration parameters following the IBC 2021 and ASCE 7-16 methodology. The Mapped Responses were estimated from the free Seismic Design Map Tool available from https://hazards.atcouncil.org. The design responses for the short (0.2 second, S_{DS}) and long period (1-second, S_{D1}) are noted in bold at the far right end of the following table.

GROUND MOTION PARAMETERS – SITE CLASS D (IBC 2021/ASCE 7-16 METHOD)								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class (unitless)**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_S	0.418	F_a	1.465	$S_{MS}=F_aS_s$	0.613	$S_{DS}=2/3\ S_{MS}$	**0.409**
1.0	S_1	0.141	F_v	2.319	$S_{M1}=F_vS_1$	0.326	$S_{D1}=2/3\ S_{M1}$	**0.217**

According to ASCE 7-16 Section 11.4.8:

> *A ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following:*
>
> 1. *Seismically isolated structures and structures with damping systems on sites with S_1 greater than or equal to 0.6,*
> 2. *Structures on Site Class E sites with S_s greater than or equal to 1.0, and*
> 3. *Structures on Site Class D and E sites with S_1 greater than or equal to 0.2*

4.3 SHALLOW FOUNDATION RECOMMENDATIONS

Provided that the structural loads are no greater than those assumed and subgrade preparation and earthwork operations are completed in strict accordance with the recommendations of this report, the proposed structures can be supported by conventional shallow foundations: individual column footings and continuous wall footings. We recommend the design of the foundations utilize the following parameters:

SHALLOW FOUNDATION DESIGN		
Design Parameter	**Column Footing**	**Wall Footing**
Net Allowable Bearing Pressure[1]	2,000 psf	2,000 psf
Acceptable Bearing Soil Material	Evaluated Native Material or New Structural Fill	Evaluated Native Material or New Structural Fill
Minimum Width for Shear Failure	30 inches	18 inches
Minimum Footing Embedment Depth (Below slab or finished grade)	12 inches	12 inches
Estimated Total Static Settlement[2]	1 inch or less	1 inch or less
Estimated Differential Settlement[3]	½ inch or less between columns	½ inch or less over 30 feet

1. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
2. The settlement calculations were based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
3. Based on maximum column/wall loads and variability in subsurface data. Differential settlement can be re-evaluated once the foundation plans are finalized.

Estimates of settlement for foundations bearing on structural or non-structural fills are strongly dependent on the quality of fill placed. Factors which may affect the quality of fill include maximum loose lift thickness of the fills placed and the amount of compactive effort placed on each lift. The final footing elevation should be evaluated by ECS personnel to document that the bearing soils are capable of supporting the recommended net allowable bearing pressure and are suitable for

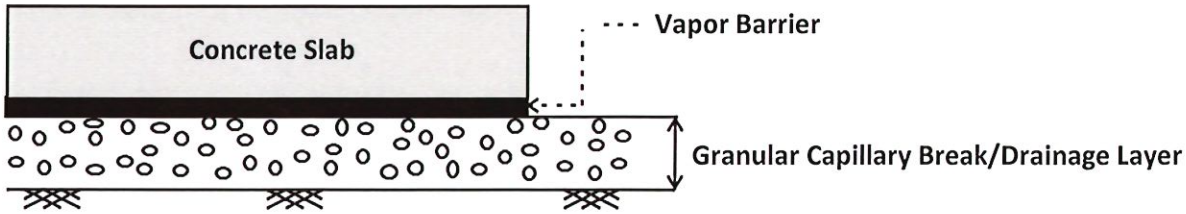
foundation construction. These evaluations should include visual observations, hand rod probing, and dynamic cone penetrometer (ASTM STP 399) testing, or other methods deemed appropriate by the geotechnical engineer at the time of construction, in each column footing excavation and at intervals not greater than 25 feet in continuous footing excavations.

Areas of Potential Undercut: Soft or unsuitable soils observed at the footing bearing elevations should be removed and replaced. Removal and replacement should be performed under the observation of ECS personnel. Undercut should be backfilled up to the original design bottom of footing elevation with one of the following:

- Lean concrete ($f'_c \geq 1{,}000$ psi at 28 days).
- AASHTO size No. 57 stone; up to 12 inches in thickness.
- Structural Fill placed and compacted in accordance with the recommendations of this report (with additional compaction testing and soil bearing evaluation).

4.4 SLABS-ON-GRADE

Provided subgrades and structural fills are prepared in accordance with the recommendations of this report, the proposed floor slabs can be constructed as ground supported slabs (Slabs-On-Grade). During initial site grading there may be areas of soft or yielding soils that should be removed and replaced with Structural Fill placed in accordance with the recommendations included in this report. Adjusting the moisture content of structural fills during earthwork operations, including the use of disking or appropriate drying equipment, may be necessary. The following graphic depicts our ground supported slab recommendations:



1. Drainage Layer Thickness: 4 inches
2. Drainage Layer Material: GRAVEL (GP, GW), SAND (SP, SW)
3. Subgrade compacted to a minimum of 95% maximum dry density per ASTM D1557

Subgrade Modulus: Provided the placement of structural fill and granular drainage layer per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 175 pci (psi/in). This value is applicable for design of slabs subject to point loads and should be reduced based on loaded area for uniform sustained distributed loads.

Slab Isolation: Ground-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab do not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab, the slab should be designed by the structural engineer of record with suitable reinforcement and load transfer devices to avoid overstressing of the slab.

Design Considerations: We also recommend that slabs-on-grade be underlain by a minimum of 4 inches of suitable material as shown in the figure above to help provide a firm working surface

for equipment and avoid the risk of capillary rise of subsurface moisture from adversely affecting the slab. If open graded aggregate is not available or is cost prohibitive, sand with less than 5 percent fines can be used provided the placement and compaction of the sand complies with the above recommendations.

A vapor barrier should be installed on top of the subgrade in areas to receive moisture-sensitive floor coverings to help reduce dampness on the surface of the floor slab. A vapor barrier is generally understood to consist of a minimum 10-mil thickness, overlapping sheets of plastic without sealing the overlap between the individual sheets. If a minimum of one foot of Structural Fill with less than 5 percent fines is placed prior to slab placement an open graded aggregate is not required under the slabs, provided that a 10 mil or thicker vapor barrier is provided.

We recommend that the perm rating of the vapor barrier be adequate to protect the rating of the floor coverings and have adequate puncture resistance according to the expected foot traffic and equipment and materials placed on the barrier. If the vapor barrier is punctured or unsealed during construction, the perm rating will likely be greatly decreased, and vapor intrusion may occur through the slab after construction. Punctures can be caused by concrete finishing, placement of reinforcement, or by equipment and foot traffic. Openings may be caused by unsealed edges at the floor wall interface or laps.

4.5 PAVEMENT DESIGN CONSIDERATIONS

We have performed analyses for new pavement sections using the SCDOT Pavement Design Guidelines (2008) and associated literature. Figure A-1 from the 2008 SCDOT Pavement Design Manual shows the relationship between the California Bearing Ratio (CBR) and the Soil Support Value (SSV). As a part our analysis, a design CBR value was estimated using the results from the CPT soundings and hand auger borings. Based on our experience in the area and the variation in the subgrade conditions throughout the project area, a CBR value of 8 was utilized in our analysis which corresponds to a SSV of approximately 3.3. This design CBR value assumes the subgrade remains stable under proofroll. The recommended minimum pavement sections are as follows:

RECOMMENDED MINIMUM PAVEMENT SECTIONS			
Material	Flexible (Asphalt) Pavement		Rigid (Concrete) Pavement
	Heavy Duty	Standard Duty	Heavy Duty
Asphaltic Concrete	3 inches	2 inches	-
Portland Cement Concrete (f'c = 4,000 psi)	-	-	6 inches
Graded Aggregate Base Course	8 inches	6 inches	4 inches

Based on our analysis using the above criteria, the pavement sections listed should be able to sustain design traffic loads of approximately 10,000 ESALs and 100,000 ESALs for light/standard duty pavement and heavy-duty pavement, respectively. A design life of 15 years for flexible (asphalt) pavement and a design life of 20 years for rigid (concrete) pavement were considered in design. Materials and workmanship should follow the latest edition of the South Carolina Department of Transportation Standard Specifications for Highway Construction. Provisions for construction traffic have not been included in our analysis.

Standard duty flexible pavement should be adequate for parking and drive areas subject only to automobile traffic. Heavy duty flexible and rigid pavements should be used in areas subject to heavy truck traffic.

Portland Cement Concrete (PCC) sections should consist of air-entrained concrete having a minimum compressive strength of 4,000 psi. Appropriate steel reinforcing and jointing should be incorporated into the design of PCC pavements. Concentrated front-wheel loads are frequently imposed on pavements in trash dumpster and truck loading dock areas. This type of loading typically results in rutting and scuffing of bituminous pavements and ultimately pavement failures and costly repairs. Therefore, we recommend that the pavements in trash pickup, loading dock aprons areas, and other areas where heavy wheel loads are expected utilize the PCC pavement section.

A stable subgrade is very important to pavement performance. Depending on planned finished grades, unsuitable material existing at shallow depth should be undercut from within the pavement areas. Unsuitable soil materials are defined as those in ASTM D2487 soil classification groups ML, MH, CH, CL, OL, and PT. The unsuitable material should be replaced with Structural Fill in accordance with the recommendations of this report.

Structural Fill should be compacted to a minimum of 95 percent of the maximum dry density, as evaluated by the Modified Proctor Compaction Test (ASTM D1557). The base course should be compacted to 98 percent of the maximum dry density, as evaluated by the Modified Proctor Compaction Test (ASTM D1557). To document that the base course has been uniformly compacted, in-place field density tests should be performed by ECS. Immediately prior to paving, the subgrade should be proofrolled under our observation and yielding and/or "pumping" areas be repaired.

As needed, excavation and replacement of topsoil and soft near surface soils may be required with the possible addition of reinforcing fabric consisting of Mirafi HP270 or equivalent below the pavement base course.

The performance of pavements will likely be dependent upon a number of factors, including subgrade conditions at the time of paving, rainwater runoff, and traffic. Rainwater runoff should not be allowed to seep below pavements from adjacent areas. Therefore, drainage swales or underdrains may be required.

The above recommendations are very important for long-term performance of the pavements. Because pavement design typically has relatively low factors of safety, it is important that the specifications are followed closely during pavement construction. Our analysis was based on the design life mentioned above; however, some isolated areas could require repair or premature maintenance in a shorter period of time.

4.6 SITE DRAINAGE

Positive drainage should be provided around the perimeter of the structure to reduce the potential for moisture infiltration into the foundation and slab subgrade soils. We recommend that landscaped areas adjacent to the structure and pavements be sloped away from the structure. Roof drains should discharge a minimum of 5 feet from the building perimeter or into below grade storm water piping. Paved areas should also be sloped to divert surface water away from the proposed building. Site drainage is the sole responsibility of the project civil engineer.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

We emphasize the importance of subgrade evaluations prior to structural fill placement and/or other construction activities. These evaluations may include proofrolling the subgrade soils, performing hand auger borings, and excavation of test pits. The mentioned evaluations would help in identifying areas of soft, loose, or otherwise unsuitable materials, which would require remedial activities.

5.1.1 Demolition, Stripping and Grubbing

The subgrade preparation should consist of stripping existing topsoil, soft undocumented fill, any remnants from previous developments, and any other soft or unsuitable materials from the 10-foot expanded building pad and 5-foot expanded pavement limits and to 5 feet beyond the toe of structural fills, where practical.

Approximately 6 inches of organic laden topsoil was observed at the existing ground surface in the hand auger borings performed adjacent to the CPT soundings. Topsoil, very loose near-surface soils, or otherwise unsuitable material may be present at unexplored areas of the site. ECS should observe and document that unsuitable surficial materials have been removed or are firm and unyielding with adequate bearing capacity prior to the placement of structural fill or footing construction.

5.1.2 Risk Associated with Undocumented Fill

Based on the previous development of the site, we expect there is an increased potential for portions of the site to have been modified in the past by grading activities resulting in the placement of undocumented fill materials. If existing fill soils containing under-compacted soils or pockets of organics or debris are encountered during construction and are not removed, then localized excessive differential settlements could occur in response to new structural loads and the on-going process of volume change which may still occur in the fill. If such non-uniform settlements occur, then moderate structural distress could result. As such, if existing undocumented fill soils are encountered during construction, they should be further evaluated by proofrolling and Dynamic Cone Penetrometer (DCP) testing as discussed below.

5.1.3 Proofrolling

After removing unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be evaluated by ECS. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons (e.g., fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of ECS. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are yielding or "pumping" subgrade, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. As needed, test pits or hand augers with Dynamic Cone Penetrometer (DCP) testing can be used to further delineate the yielding material identified during proofrolling. Methods of subgrade repair, such as undercutting, moisture conditioning, or installation of geosynthetic fabric

or geogrid should be discussed with ECS to evaluate the appropriate procedure with regard to the existing conditions causing the instability.

5.1.4 Site Temporary Dewatering

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil testing is not continuous, and thus soil and groundwater conditions may vary between testing locations. If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to evaluate dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade, and pavements, etc. Water discharged from any site dewatering system shall be discharged in accordance with local, state, and federal requirements.

5.2 EARTHWORK OPERATIONS

5.2.1 Structural Fill

Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which may include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to establish if they meet project specifications.

Structural Fill Materials: Materials satisfactory for use as structural fill should consist of inorganic soils classified as SM, SC, SW, SP, GW, GP, GM, and GC, or a combination of these group symbols, per ASTM D2487. The structural fill materials should be free of organic matter, debris, and should contain particle sizes less than 1 ½ inches in the largest dimension. Open graded materials, such as gravels (GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable structural fill material should consist of inorganic soils with the following engineering properties and compaction requirements.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Atterberg Limits	LL < 35, PI<10
Max. Particle Size	1 ½ inches
Fines Content (% passing the #200 sieve)	Max. 25 % passing #200 sieve
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Modified Proctor, ASTM D1557
Required Compaction	95% of Max. Dry Density
Moisture Content	-3 to +3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

Unsatisfactory Materials: Materials that should not be used as structural fill include topsoil, organic materials (OH, OL), and low to high plasticity CLAYS and SILTS (CL, ML, CH, MH). Such materials removed during grading operations should be removed from the site and legally disposed.

Fill Placement Considerations: Fill materials should not be placed on excessively wet soils. Borrow fill materials should not be excessively wet at the time of placement. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned. At the end of each workday, fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water.

Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which tends to degrade subgrade soils. Alternatively, if these soils cannot be stabilized by conventional methods as previously discussed, additional modifications to the subgrade soils such as cement stabilization may be utilized to adjust the moisture content. If cement is utilized to control moisture contents and/or for stabilization, regular Type I/II cement can be used. The contractor should be required to minimize dusting or implement dust control measures, as required.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.2.2 On-Site Borrow Suitability

Approximately 6 inches of organic laden topsoil was observed in the hand auger borings. Below the surface material, Silty SAND (SM) was observed to a depth of approximately 4 feet below the current site grades.

In our experience, the on-site upper Silty SAND (SM) materials may be used as Structural Fill. Laboratory testing results for the on-site SM material indicated a natural moisture content ranging between approximately 10 to 13 percent and a percent passing no. 200 sieve ranging between approximately 18 to 26 percent, where tested. If the onsite sandy materials are utilized for Structural Fill in lieu of imported materials, the grading contractor should anticipate additional moisture conditioning efforts to facilitate compaction and reduce the risk of pumping conditions during placement.

Low to high plasticity materials (CL, CH), if encountered, are not generally recommended for use as Structural Fill.

5.2.3 Foundation And Slab Observations

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 2 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to document that the bearing soils are what were anticipated. If loose, soft, or unsuitable soils are observed at the footing bearing elevations, these soils should be removed and replaced prior to concrete placement.

Slab Subgrade Observation: A representative of ECS should be called to observe slab subgrades prior to drainage layer placement to document that adequate subgrade preparation has been achieved. A proofroll using a loaded dump truck should be performed in their presence at that time.

5.3 GENERAL CONSTRUCTION CONSIDERATIONS

Construction Monitoring: ECS should be on-site full-time during earthwork and foundation construction activities to document that our recommendations are followed and to provide recommendations for remedial activities, where necessary. If we are not retained for geotechnical consulting during earthwork construction and foundation construction, ECS cannot be responsible for long-term performance of the subgrade-supported construction.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to remove surface water from development areas, including structural and pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each workday, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Erosion Control: The surface soils may be erodible. Therefore, the contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. Erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

Means and Methods: Please note that the contractor is fully responsible for the means and methods employed in the construction of the project, and that the contractor shall confirm that work is conducted in accordance with OSHA standards.

Excavation Safety: Cuts or excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to confirm that adequate protection of the excavations and trench walls is provided.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by Alliance Consulting Engineers, Inc. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram

Test Location Diagram

SUBSURFACE EXPLORATION PROCEDURE:
Kessler Dynamic Cone Penetrometer (KDCP)
ASTM D6951

In this procedure, the Kessler DCP is driven into undisturbed soil or compacted materials, or both in order to provide penetration resistance values at shallow depths. The depth of cone penetration is measured at selected penetration or hammer drop intervals and the soil shear strength is reported in terms of DCP index. The DCP index is based on the average penetration depth resulting from one blow of the hammer. The index values are correlated to strength parameters, such as California Bearing Ratio (CBR), which can be used in pavement recommendations and identify strata thickness and shear strength.

Kessler DCP Procedure:

- Involves driving a disposable 0.79-inch cone tip into the ground by dropping either a Single-Mass 10.1 lb (4.6 kg) Hammer or a Dual-Mass 17.6 lb (8 kg) Hammer from a height of 22.6 in (575mm).

- Utilizing a sliding attachment to record the distance, to the nearest 1 mm (0.04 in) that the DCP tip has penetrated. Measurements are obtained continuously through the soil strata.

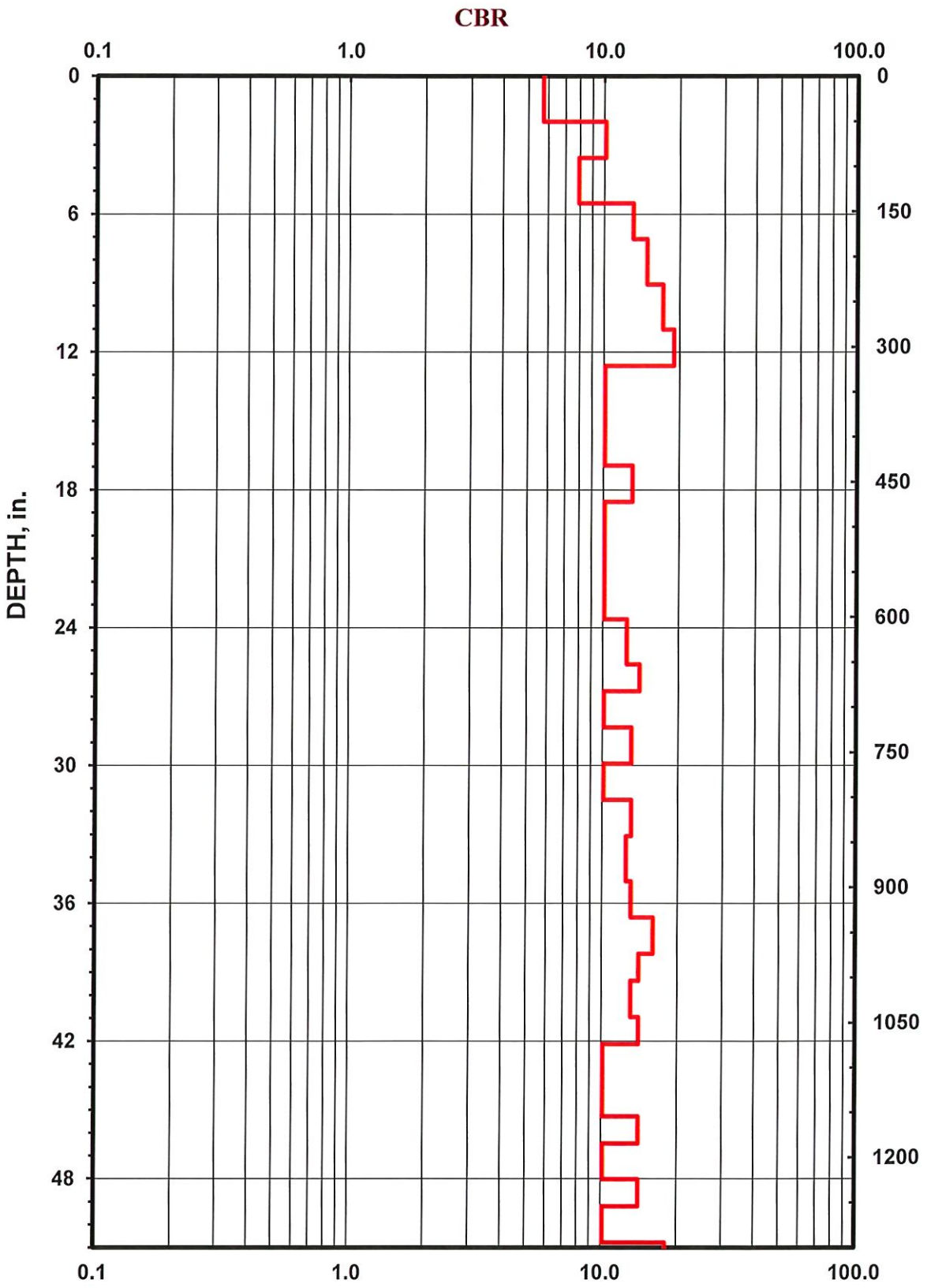
Location: K-01 **Date:** 7/17/2023

Soil Type(s): SM

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

f s	Accumulative Penetration (mm)	Type of Hammer
	0	2
	50	2
	90	2
	140	2
	180	2
	230	2
	280	2
	320	2
	360	2
	400	2
	430	2
	470	2
	520	2
	560	2
	600	2
	650	2
	680	2
	720	2
	760	2
	800	2
	840	2
	890	2
	930	2
	970	2
	1000	2
	1040	2
	1070	2
	1110	2
	1150	2
	1180	2
	1220	2
	1250	2
	1290	2
	1320	2



Location: K-02

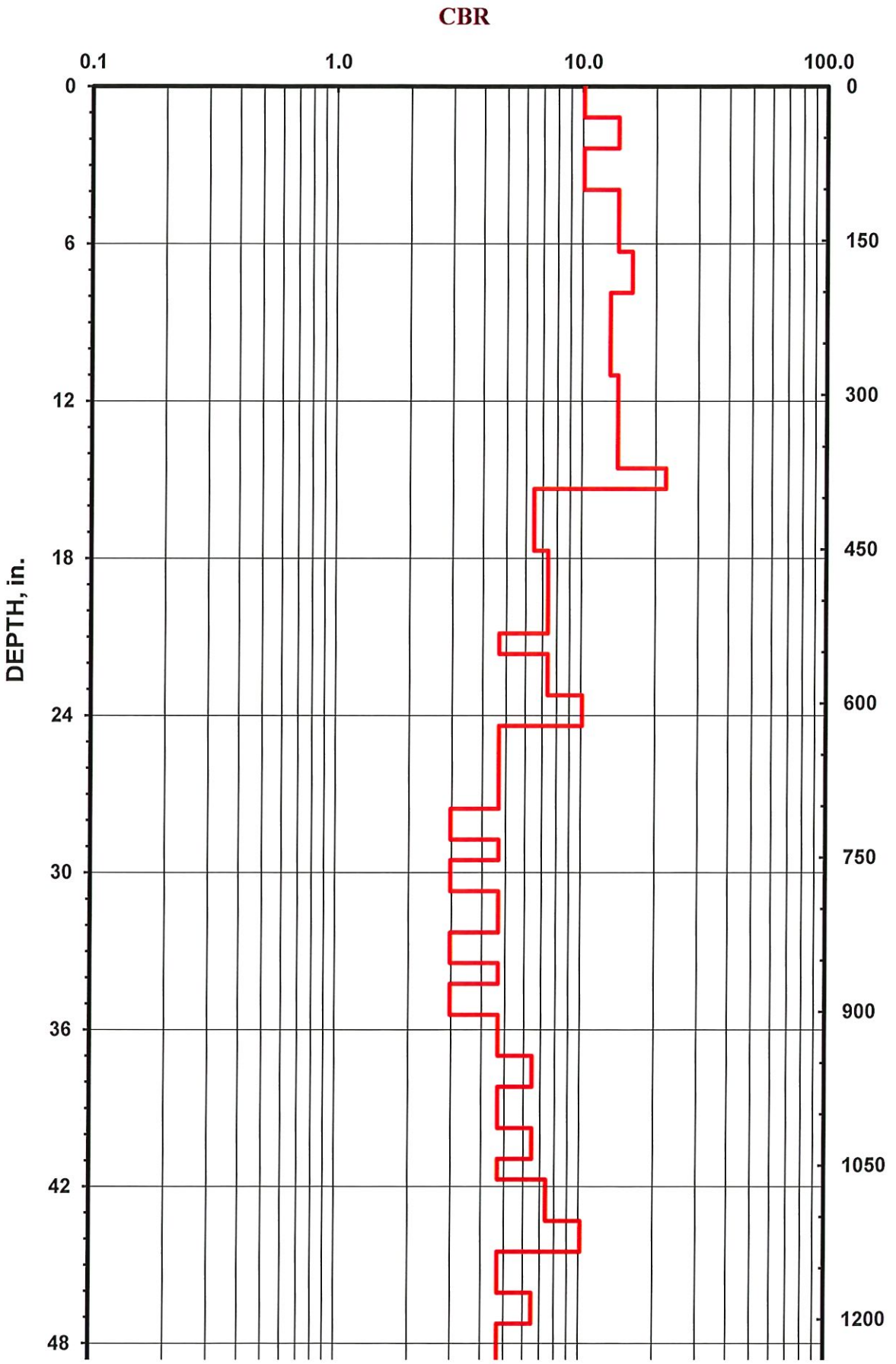
Date: 7/17/2023

Soil Type(s): SM

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

f s	Accumulative Penetration (mm)	Type of Hammer
	0	2
	30	2
	60	2
	100	2
	130	2
	160	2
	200	2
	240	2
	280	2
	310	2
	340	2
	370	2
	390	2
	450	2
	490	2
	530	2
	550	2
	590	2
	620	2
	660	2
	680	2
	700	2
	730	2
	750	2
	780	2
	800	2
	820	2
	850	2
	870	2
	900	2
	940	2
	970	2
	990	2
	1010	2
	1040	2
	1060	2
	1100	2
	1130	2



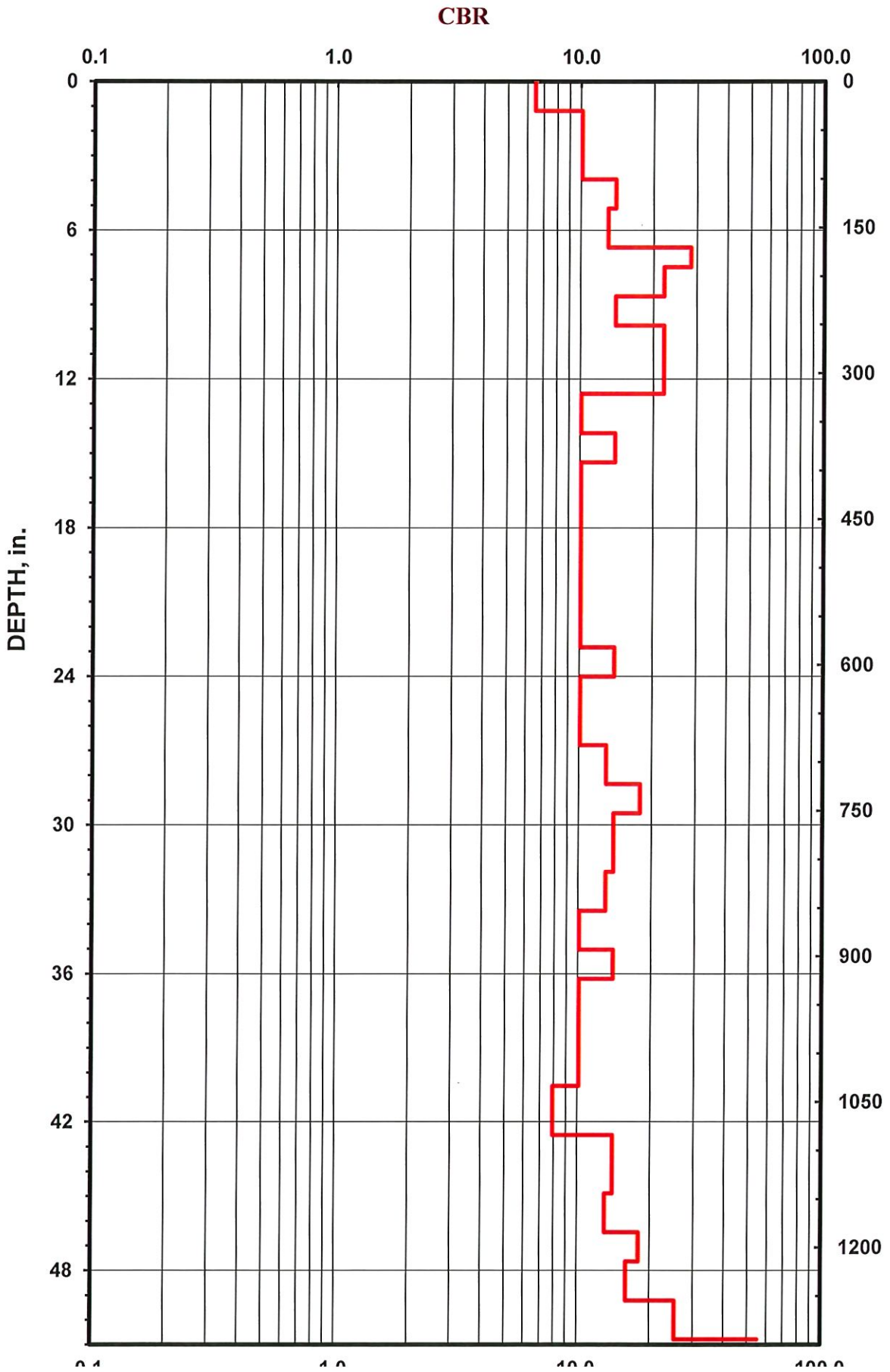
Location: K-03 **Date:** 7/17/2023

Soil Type(s): SM

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

f s	Accumulative Penetration (mm)	Type of Hammer
	0	2
	30	2
	60	2
	100	2
	130	2
	170	2
	190	2
	220	2
	250	2
	280	2
	320	2
	360	2
	390	2
	440	2
	480	2
	510	2
	540	2
	580	2
	610	2
	650	2
	680	2
	720	2
	750	2
	780	2
	810	2
	850	2
	890	2
	920	2
	960	2
	1000	2
	1030	2
	1080	2
	1110	2
	1140	2
	1180	2
	1210	2
	1250	2
	1290	2



APPENDIX C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)	0.1 in.	0.2 in.	
K-01	S-2	1.5	10.4	SM	NP	NP	NP	18					
K-02	S-4	3.5	12.8	SM	NP	NP	NP	26					
K-03	S-4	3.5	12.5	SM	NP	NP	NP	19					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Turbeville Library
Client: Alliance Consulting Engineers, Inc
Project No.: 34:4590
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Charleston	5935 RIVERS AVENUE Suite 105A North Charleston, SC 29406	(843)654-4448 (843)884-7990

Tested by	Checked by	Approved by	Date Received

APPENDIX D – Miscellaneous

Important Information about your Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

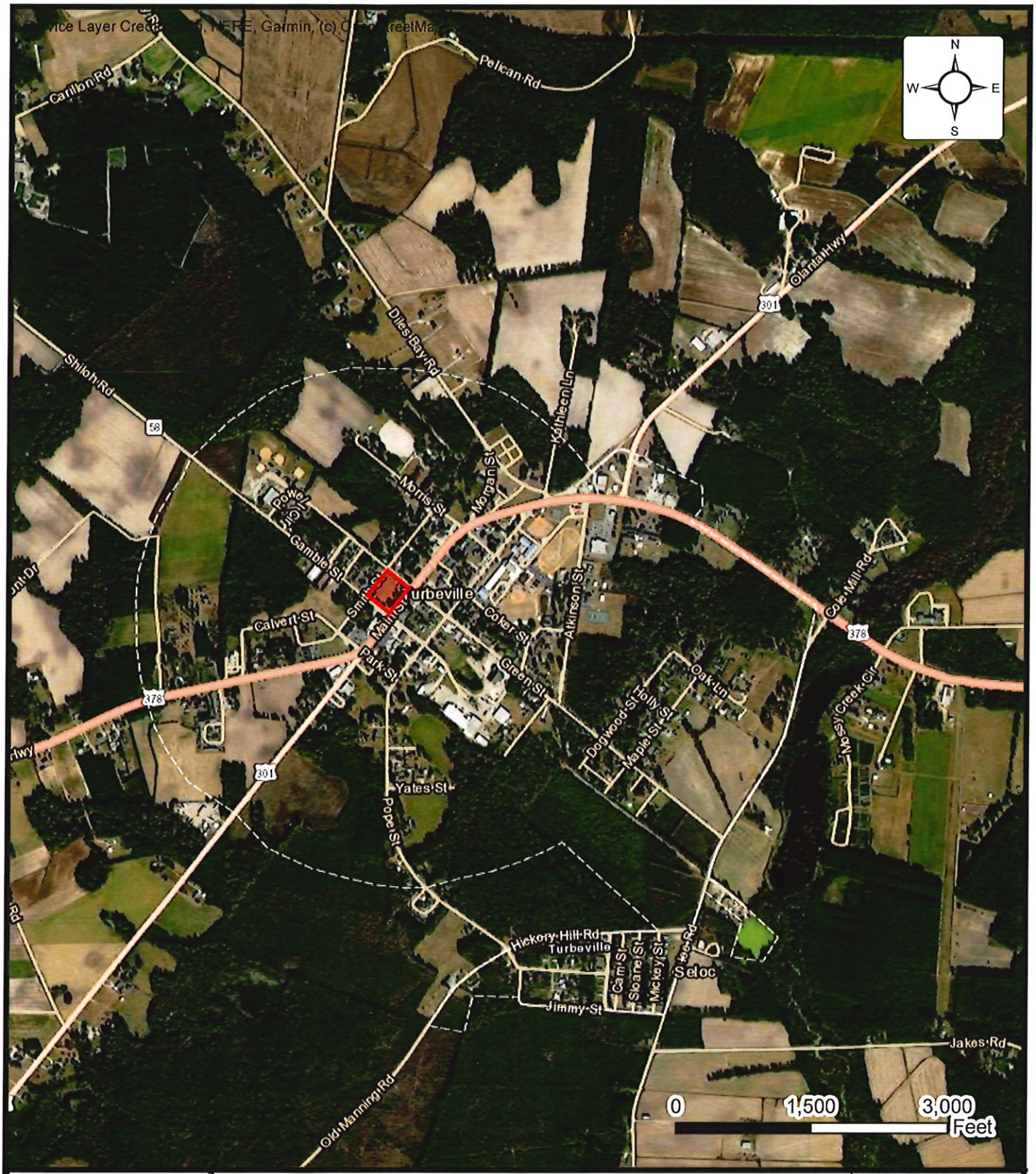
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2019 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document or its wording as a complement to or as an element of a report of any kind. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent or intentional (fraudulent) misrepresentation.



SITE LOCATION DIAGRAM
TURBEVILLE LIBRARY

GAMBLE STREET& MAIN STREET
TURBEVILLE, SOUTH CAROLINA 29162
ALLIANCE CONSULTING ENGINEERS, INC

ENGINEER	NF
SCALE	AS NOTED
PROJECT NO.	34:4590
FIGURE	1 OF 2
DATE	7/13/2023

TEST LOCATION DIAGRAM
TURBEVILLE LIBRARY

GAMBLE STREET & MAIN STREET
TURBEVILLE, SOUTH CAROLINA 29162
ALLIANCE CONSULTING ENGINEERS, INC

ENGINEER	AG
SCALE	AS NOTED
PROJECT NO.	34:4590
FIGURE	2 OF 2
DATE	8/15/2023

APPENDIX B – Field Operations

Reference Notes for Cone Penetration Test (CPT) Soundings

Subsurface Exploration Procedure: Cone Penetration Testing (CPT) ASTM D 5778

CPT Logs (C-01 to C-02)

Reference Notes for Boring Logs

Subsurface Exploration Procedure: Hand Auger Boring ASTM D1452

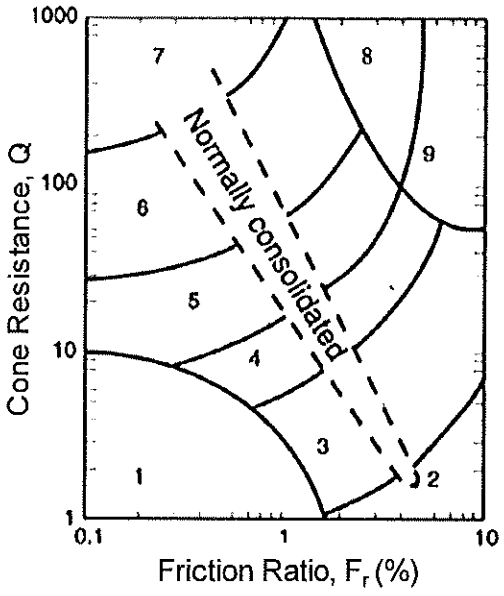
Hand Auger Boring Logs (C-01, C-02, and K-01 to K-03)

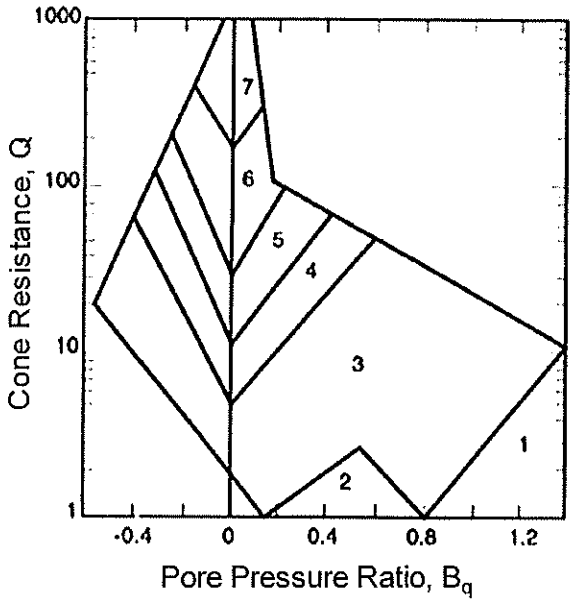
Subsurface Exploration Procedure: Kessler Dynamic Cone Penetrometer (DCP) ASTM D6951

KDCP Test Data (K-01 to K-03)

REFERENCE NOTES FOR CONE PENETRATION TEST (CPT) SOUNDINGS

In the CPT sounding procedure (ASTM-D-5778), an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (q_c), pore water pressure (u_2), and sleeve friction (f_s). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, preconsolidation pressure, and undrained shear strength. The graphs below represent one of the accepted methods of CPT soil behavior classification (Robertson, 1990).





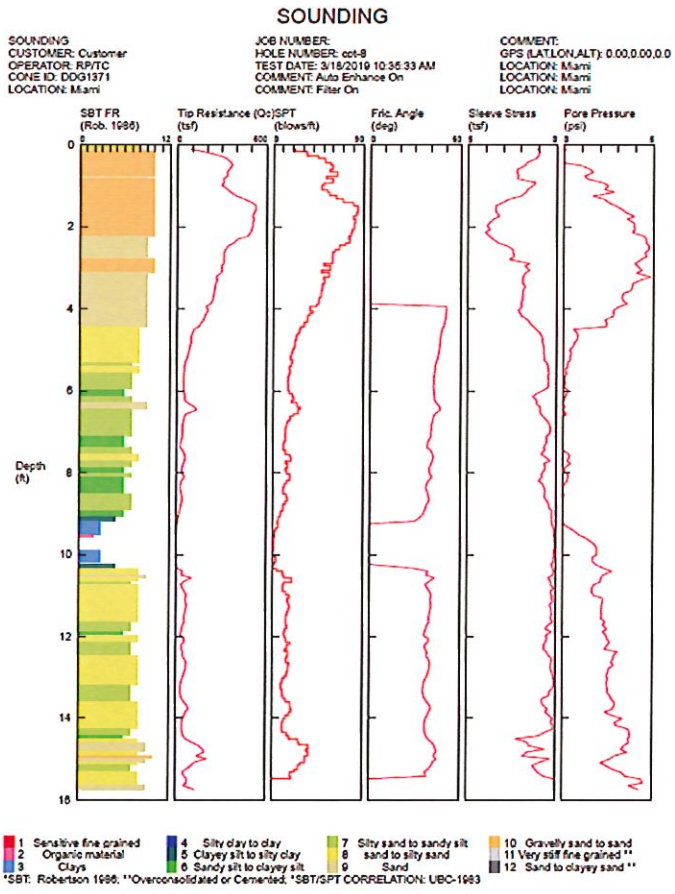
1. Sensitive, Fine Grained
2. Organic Soils-Peats
3. Clays; Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt
6. Clean Sands to Silty Sands
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff Fine Grained

The following table presents a correlation of corrected cone tip resistance (q_c) to soil consistency or relative density:

SAND		SILT/CLAY	
Corrected Cone Tip Resistance (q_c) (tsf)	**Relative Density**	**Corrected Cone Tip Resistance (q_c) (tsf)**	**Relative Density**
<20	Very Loose	<5	Very Soft
20-40	Loose	5-10	Soft
40-120	Medium Dense	10-15	Firm
		15-30	Stiff
120-200	Dense	30-45	Very Stiff
>200	Very Dense	45-60	Hard
		>60	Very Hard

SUBSURFACE EXPLORATION PROCEDURE: CONE PENETRATION TESTING (CPT) ASTM D 5778

In the CPT sounding procedure, an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (qc), pore water pressure (U2), and sleeve friction (fs). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, pre-consolidation pressure, and undrained shear strength.



CPT Procedure:

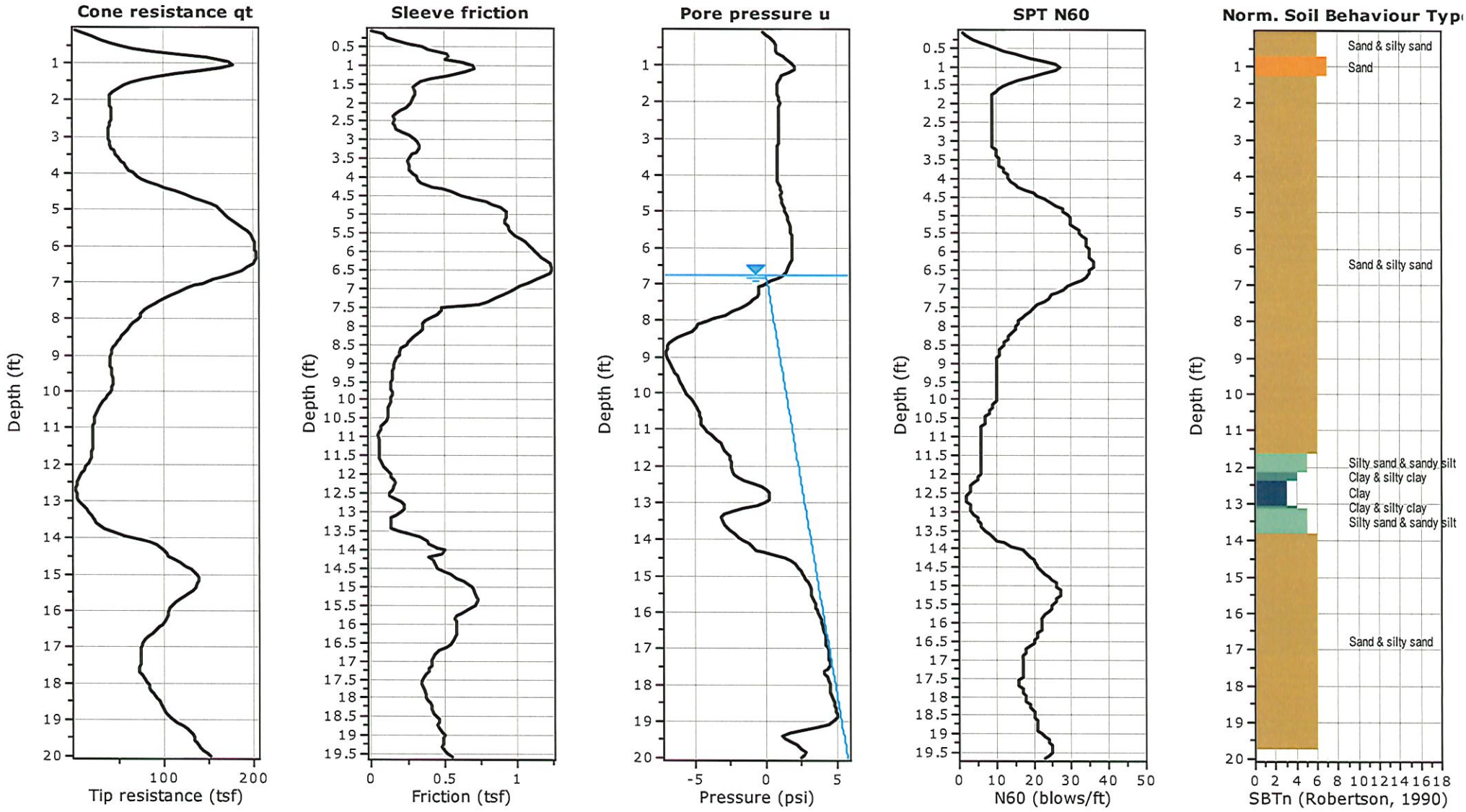
- Involves the direct push of an electronically instrumented cone penetrometer* through the soil
- Values are recorded continuously
- CPT data is corrected and correlated to soil parameters

**CPT Cone Size May Vary*

ECS Southeast, LLP
5935 Rivers Avenue, Suite 105A
North Charleston, SC 29406
ECS Project #: 34:4590

Project: Turbeville Library
Location: Turbeville, South Carolina

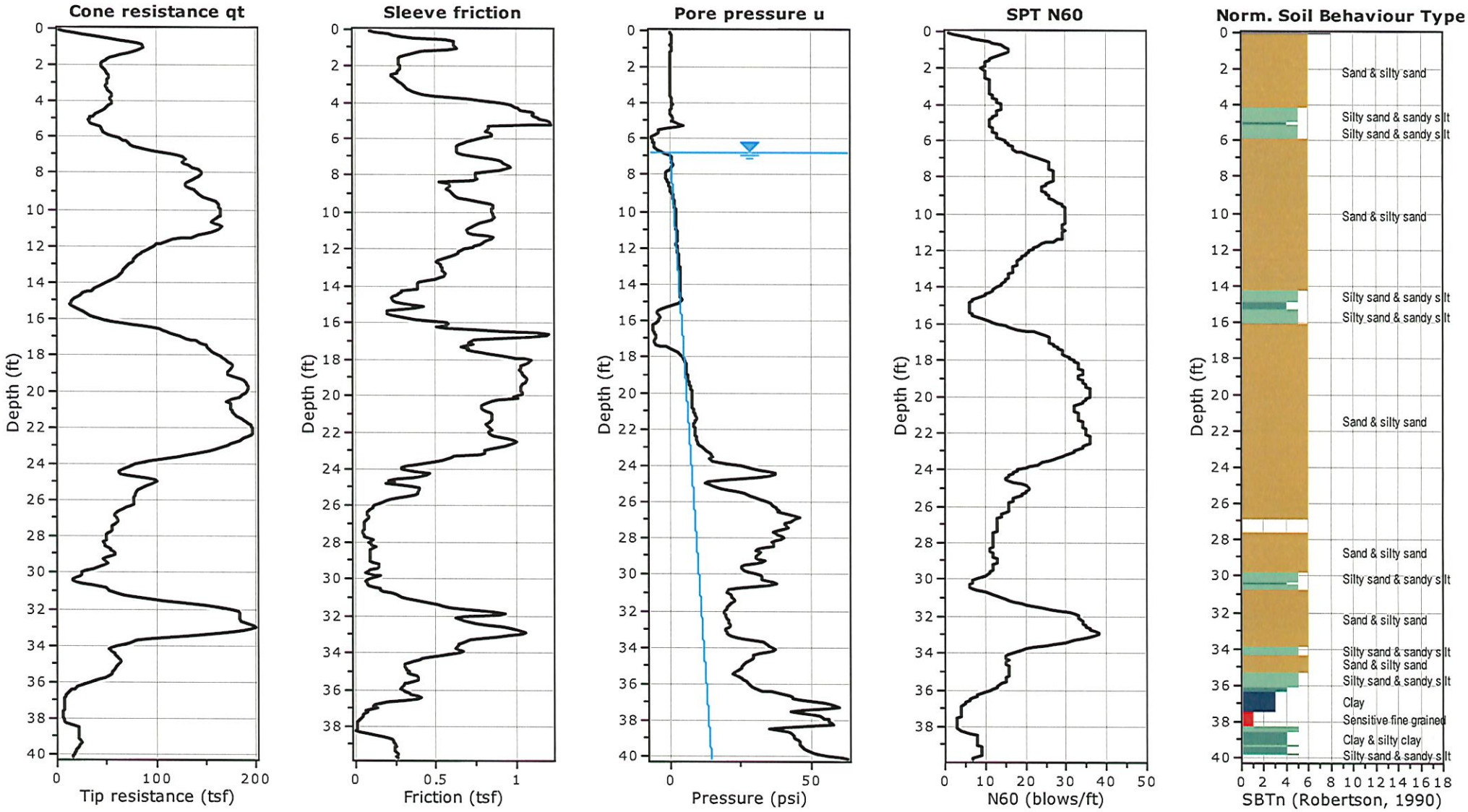
CPT: C-1
Total depth: 19.99 ft, Date: 8/7/2023



ECS Southeast, LLP
5935 Rivers Avenue, Suite 105A
North Charleston, SC 29406
ECS Project #: 34:4590

Project: Turbeville Library
Location: Turbeville, South Carolina

CPT: C-2
Total depth: 40.14 ft, Date: 8/7/2023



REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

	ASPHALT	
	CONCRETE	
	GRAVEL	
	TOPSOIL	
	VOID	
	BRICK	
	AGGREGATE BASE COURSE	
	GW	WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP	POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM	SILTY GRAVEL gravel-sand-silt mixtures
	GC	CLAYEY GRAVEL gravel-sand-clay mixtures
	SW	WELL-GRADED SAND gravelly sand, little or no fines
	SP	POORLY-GRADED SAND gravelly sand, little or no fines
	SM	SILTY SAND sand-silt mixtures
	SC	CLAYEY SAND sand-clay mixtures
	ML	SILT non-plastic to medium plasticity
	MH	ELASTIC SILT high plasticity
	CL	LEAN CLAY low to medium plasticity
	CH	FAT CLAY high plasticity
	OL	ORGANIC SILT or CLAY non-plastic to low plasticity
	OH	ORGANIC SILT or CLAY high plasticity
	PT	PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

- WL (First Encountered)
- WL (Completion)
- WL (Seasonal High Water)
- WL (Stabilized)

FILL AND ROCK

FILL | POSSIBLE FILL | PROBABLE FILL | ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

© 2021 ECS Corporate Services, LLC. All Rights Reserved

SUBSURFACE EXPLORATION PROCEDURE:
Hand Auger Borings
ASTM D1452

In this procedure, a shallow depth boring is made by manually rotating and advancing an auger to the desired depths while periodically removing the auger from the hole to clear and examine the auger cuttings. The auger cuttings are visually classified in the field in accordance with ASTM D2488. Disturbed samples are collected in each soil stratum and sealed in an airtight container and labeled appropriately.

Hand Auger Procedure:

- Involves manually rotating a tube or barrel type auger to the desired sample depth
- Recording the depth of changes in strata
- Describing soil in each major stratum in accordance with ASTM D2488
- Recording groundwater depth and location of seepage zones, when/if found
- Describing condition of augered hole (i.e. whether the hole remains open or the sides cave)

CLIENT:	PROJECT NO.:	SHEET:
Alliance Consulting Engineers, Inc	**34:4590**	**1 of 1**
PROJECT NAME:	HAND AUGER NO.:	SURFACE ELEVATION:
Turbeville Library	**C-01**	
SITE LOCATION:		STATION:
Gamble Street, Turbeville, South Carolina, 29162		
NORTHING:	EASTING:	

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	EXCAVATION EFFORT	DCP	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil Thickness[6"]					
			(SM) SILTY SAND, tan and dark brown, moist					
			(SM) SILTY SAND, trace clay, orangish tan, moist					
			(SM) SILTY SAND, trace clay, grayish tan mottled orange, moist					
			END OF HAND AUGER AT 4 FT					
5								
10								
15								

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDRY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

▽ WL (First Encountered)	▼ WL (Seasonal High)	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
▼ WL (Completion)		**NF**	**Jul 10 2023**	**Feet**	

HAND AUGER LOG

CLIENT:	PROJECT NO.:	SHEET:
Alliance Consulting Engineers, Inc	**34:4590**	**1 of 1**
PROJECT NAME:	HAND AUGER NO.:	SURFACE ELEVATION:
Turbeville Library	**C-02**	
SITE LOCATION:		STATION:
Gamble Street, Turbeville, South Carolina, 29162		
NORTHING:	EASTING:	

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	EXCAVATION EFFORT	DCP	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil Thickness[6"]					
			(SM) SILTY SAND, tan, moist					
			(SM) SILTY SAND, trace clay, orangish tan, moist					
			(SM) SILTY SAND, orangish tan, moist					
			(SM) SILTY SAND, trace clay, orangish tan mottled light gray, moist					
			END OF HAND AUGER AT 4 FT					
5								
10								
15								

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDRY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

▽ WL (First Encountered)	▼ WL (Seasonal High)	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
▼ WL (Completion)		**NF**	**Jul 10 2023**	**Feet**	

HAND AUGER LOG

CLIENT:	PROJECT NO.:	SHEET:
Alliance Consulting Engineers, Inc	**34:4590**	**1 of 1**
PROJECT NAME:	HAND AUGER NO.:	SURFACE ELEVATION:
Turbeville Library	**K-01**	
SITE LOCATION:		STATION:
Gamble Street, Turbeville, South Carolina, 29162		
NORTHING:	EASTING:	

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	EXCAVATION EFFORT	DCP	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil Thickness[6"]					
			(SM) SILTY SAND, dark brown, moist					
			(SM) SILTY SAND, orangish tan, moist			S-2	18	10.4
			(SM) SILTY SAND, trace clay, grayish tan mottled orange, moist					
			END OF HAND AUGER AT 4 FT					
5								
10								
15								

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDRY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

▽ WL (First Encountered)	▼ WL (Seasonal High)	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
▼ WL (Completion)		**NF**	**Jul 10 2023**	**Feet**	

HAND AUGER LOG

CLIENT:	PROJECT NO.:	SHEET:
Alliance Consulting Engineers, Inc	**34:4590**	**1 of 1**
PROJECT NAME:	HAND AUGER NO.:	SURFACE ELEVATION:
Turbeville Library	**K-02**	
SITE LOCATION:		STATION:
Gamble Street, Turbeville, South Carolina, 29162		
NORTHING:	EASTING:	

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	EXCAVATION EFFORT	DCP	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil Thickness[6"]					
			(SM) SILTY SAND, tan, moist					
			(SM) SILTY SAND, orangish brown, moist					
			(SM) SILTY SAND, trace clay, orangish brown mottled gray, moist					
			(SM) SILTY SAND, trace clay, grayish brown mottled orange, moist			S-4	26	12.8
			END OF HAND AUGER AT 4 FT					
5								
10								
15								

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDRY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

▽ WL (First Encountered)	▼ WL (Seasonal High)	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
▼ WL (Completion)		**NF**	**Jul 10 2023**	**Feet**	

HAND AUGER LOG

CLIENT:	PROJECT NO.:	SHEET:
Alliance Consulting Engineers, Inc	**34:4590**	**1 of 1**
PROJECT NAME:	HAND AUGER NO.:	SURFACE ELEVATION:
Turbeville Library	**K-03**	
SITE LOCATION:		STATION:
Gamble Street, Turbeville, South Carolina, 29162		
NORTHING:	EASTING:	

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DESCRIPTION OF MATERIAL	EXCAVATION EFFORT	DCP	SAMPLE NUMBER	FINES CONTENT (%)	MOISTURE CONTENT (%)
			Topsoil Thickness[6"]					
			(SM) SILTY SAND, grayish tan, moist					
			(SM) SILTY SAND, trace clay, orangish brown, moist					
			(SM) SILTY SAND, orangish brown, moist					
			(SM) SILTY SAND, trace clay, orangish brown, moist			S-4	19	12.5
			END OF HAND AUGER AT 4 FT					
5								
10								
15								

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDRY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

▽ WL (First Encountered)	▼ WL (Seasonal High)	ECS REP:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:
▼ WL (Completion)		**NF**	**Jul 10 2023**	**Feet**	

HAND AUGER LOG

This page intentionally left blank

DOCUMENT 00 41 01 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

PART 1 -

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Turbeville Branch Library

C. Project Location: 1178 Smith Street, Turbeville, SC 29162.

D. Owner: Clarendon County Administration.

E. Architect: Craig Gaulden Davis, Inc.

F. Architect Project Number: 22067.

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Craig Gaulden Davis, Inc. and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars ($_____)

B. DEDUCT ALTERNATE NO. 1**: Asphalt shingle roof.**

1. Provide a deduct alternate to furnish and install asphalt shingle roofing, as specified in Specification Section 07 31 13 – “Asphalt Shingles” in lieu of standing seam metal roofing (base bid).

2. _____ Dollars ($_____)

1.3 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____ Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS AND SUPPLIERS

A. The following companies shall execute subcontracts for the portions of the Work indicated:

1. Plumbing Work: _____.

2. HVAC Work: _____.

3. Electrical Work: _____.

1.5 UNIT PRICES

A. Unit Prices are proposed as follows:

1. **Unit Price No. 1**: Removal & Replacement of Unsatisfactory Soil Material:

_____ / Cubic Yard

2. **Unit Price No. 2:** Mass Rock Excavation and Replacement with Satisfactory Soil Material:

_____/ Cubic Yard

3. **Unit Price No. 3:** Trench Rock Excavation and Replacement with Satisfactory Soil Material:

_____/ Cubic Yard

1.6 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated _____.

2. Addendum No. 2, dated _____.

3. Addendum No. 3, dated _____.

4. Addendum No. 4, dated _____.

1.7 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Clarendon County, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.8 SUBMISSION OF BID

A. Respectfully submitted this __ day of _____, 2025.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

F. Witness By:_____(Handwritten signature).

G. Attest:_____(Handwritten signature).

H. By:_____(Type or print name).

I. Title:_____(Corporate Secretary or Assistant Secretary).

J. Street Address:_____.

K. City, State, Zip:_____.

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here).

END OF SECTION

This page intentionally left blank

AIA® Document A310™ – 2010

Bid Bond

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

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

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

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

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

BOND AMOUNT:

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

Project Number, if any:

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

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

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

Signed and sealed this day of

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

Init.
/

AIA Document A310™ – 2010. Copyright © 1963, 1970 and 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This document was created on 01/27/2012 07:23:12 under the terms of AIA Documents-on-Demand™ order no. 2008397483 , and is not for resale. This document is licensed by The American Institute of Architects for one-time use only, and may not be reproduced prior to its completion. 061110

This page intentionally left blank

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

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

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

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

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

Sample

AIA Document A312™ – 2010 Performance Bond. Copyright © 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org. 061110

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

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

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

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

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

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

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

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

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

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

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

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

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

Sample

AIA Document A312™ – 2010 Performance Bond. Copyright © 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

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

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

Sample

AIA Document A312™ – 2010 Performance Bond. Copyright © 2010 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

§ 16 Modifications to this bond are as follows:

Sample

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

Init.
/

AIA Document A312™ – 2010 Performance Bond. Copyright © 2010 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

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

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

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

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

Sample

AIA Document A312™ – 2010 Payment Bond. Copyright © 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org. 061110

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

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

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

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

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

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

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

.2 have sent a Claim to the Surety (at the address described in Section 13).

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

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

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

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

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

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

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

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

Sample

AIA Document A312™ – 2010 Payment Bond. Copyright © 2010 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

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

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

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

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

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

§ 16 Definitions

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

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

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

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

Sample

AIA Document A312™ – 2010 Payment Bond. Copyright © 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

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

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

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

§ 18 Modifications to this bond are as follows:

Sample

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

AIA Document A312™ – 2010 Payment Bond. Copyright © 2010 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

DRAFT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

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

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

«Clarendon County »« »
«411 Sunset Drive »
«Manning, South Carolina 29102 »
«(803) 433-3240 (Procurement Office) »

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

« »« »
« »
« »
« »

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

«Turbeville Branch Library »
«Turbeville, South Carolina »
«
Construction of a one-story public library for the Town of Turbeville in Clarendon County, South Carolina. Project location is 1178 Smith Street, Turbeville, South Carolina 29162 »

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

«Craig, Gaulden and Davis, LLC | PBK Architecture »« »
«19 Washington Park »
«Greenville, South Carolina 29601 »
«(864) 242-0761 »

The Owner and Contractor agree as follows.

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

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[«X »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

[«X »] Not later than «three hundred sixty five » («365 ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
Asphalt Shingle Roof Provide a deduct price to furnish and install asphalt shingle roofing, as specified in Specification Section 07 31 13 – "Asphalt Shingles" in lieu of standing seam metal roofing (base bid).	

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
Allowance No. 1 Allowance No. 1: Provide an allowance of $ 15,000 to furnish and install room signs and building mounted letters as specified in Specification Sections 10 14 19 - "Dimensional Letter Signage" and 10 14 23 - "Panel Signage." Allowance shall include all applicable taxes and fees.	$15,000.00

§ 4.4 Unit prices, if any:

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

«Five Percent (5%) »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

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

§ 5.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

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

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

« »

§ 5.3 Interest

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 08:57:30 ET on 03/01/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1834046818)

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Turbeville Branch Library
Clarendon County
1178 Smith Street
Turbeville, South Carolina 29162

THE OWNER:
(Name, legal status and address)

Clarendon County Administration
411 Sunset Drive
Clarendon, South Carolina 29102
803-435-0135

THE ARCHITECT:
(Name, legal status and address)

Craig, Gaulden and Davis, Inc.
19 Washington Park
Greenville, South Carolina 29601
864-242-0761

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

DRAFT

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

INDEX
(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal
Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

§ 3.4 Labor and Materials

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

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 3.5 Warranty

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

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. All materials shall be covered at the end of the workday and secured to prevent movement during windy conditions.

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

§ 4.2.7.1 When the review of a shop drawing submittal exceeds more than two reviews by the Architect in conformity with the contractor's approved submittal schedule, this will be reviewed by the Architect as an Additional Service after notification to the Owner. The cost for this additional service shall be deducted by change order from the Contractor's contract amount.

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

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

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.1.4 The combined overhead and profit included in the total cost to the Owner for a change in the work shall be based on the following schedule:

.1 For the Prime Contractor, for work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For each Subcontractor involved, for work performed by the Subcontractor's own forces fifteen percent (15%) of the cost.

.3 For the Prime Contractor, for work performed by the Contractor's Sub-contractor, seven percent (7%) of the amount due the Subcontractor.

.4 For each Subcontractor for work performed by the Subcontractor's Subcontractor, seven percent (7%) of the amount due the Sub-Subcontractor.

.5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case shall changes involving over $1,000.00 be approved without such itemization.

§ 7.2 Change Orders

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

.6 The change in the Work;

.7 The amount of the adjustment, if any, in the Contract Sum; and

.8 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

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

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

§ 7.3.2.1 All Construction Change Directives shall be signed by the Architect and the Owner before the Contractor

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

begins the work covered by the Construction Change Directive.

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

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

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

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

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

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

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

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

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

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

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

§ 7.4 Minor Changes in the Work

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.1.1 No claims for extension of time will be granted when based on delays caused by conditions existing at the time bids were received and of which the Contractor might be reasonably expected to have knowledge at the time of bidding, or upon delays caused by failure on part of the Contractor to anticipate properly the requirements of the work contracted for as to materials, labor, and equipment. All claims for an extension of time shall be made in accordance with paragraph 15.1.2.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The form of Application for Payment, duly notarized, shall be a current edition of AIA Document G702, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703, Continuation Sheet or in a format approved by the Owner and Architect. If bonding is required on the Project, each application for payment shall include the following certification: "We certify that the surety for this project has been notified of this request and consents payment of this requires." Application shall be notarized and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require such as copies or requisitions from Subcontractors and material suppliers. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers and shall reflect retainage if provided for in the Contract Documents.

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

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

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

§ 9.3.2.1 When Applications for Payment includes products stored either on or off the Project site, but not incorporated in the Work, for which no previous payment has been requested, a complete description of such products shall be attached to the Application for Payment. Stored materials or products, which are located off the Project site, shall be stored in a bonded warehouse with the stored products properly tagged and identified for the Project.

§ 9.3.2.2 The Owner's written approval must be obtained before using an off-site storage facility. Storage of materials or products shall not be stored on a supplier or subcontractor's premises unless approved in writing by the Owner. Contractor requesting payment for off-site storage of materials or products shall provide a certificate of insurance for all of the off-site stored materials and or products naming the Owner as the insured.

§ 9.3.2.3 Rental equipment including but not limited to, mobile equipment, pans, forms, scaffolding, compressors, etc., shall not be considered as stored materials.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

§ 9.3.3.1 Owner shall be entitled to retain (5%) of the amount approved by the Architect for payment in each Application for Payment. ~~until the work of the entire Project is fifty percent (50%) complete, at which time the Owner may, at the Owner's discretion, reduce the retainage amount to (5%).~~ In the event the Owner decides to reduce the retainage amount, the Owner's decision may, but is not required, to consider one or more of the following; the Contractor's performance and the anticipated performance; payment by Contractor to subcontractors and /or suppliers; Fiscal solvency of Contractor; quality of Work performed by Contractor; and written concurrence from Contractor's surety and other factors deemed pertinent by the Owner. The Owner reserves the right to reinstate the retainage requirements at any time.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

§ 9.8.2.1 The Work will not be considered for Substantial Completion review until all project systems are operational as designed, all governmental inspections and certificates have been received and posted, designated instructions to the Owner's personnel in the operation of all systems has been completed and all final finishes are in place. The only remaining work shall be minor in nature, such that the Owner could occupy the facility and the remaining completion of items by the Contractor would not interfere with the Owner's normal operations.

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

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

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

§ 9.9 Partial Occupancy or Use

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

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

§ 9.10 Final Completion and Final Payment

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.2.1 In addition to the items listed above, the following items must be submitted:

(a) Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706.
(b) Contractor's Affidavit of Release of Liens, AIA Document G706A
(c) Consent of Surety to Final Payment, AIA Document G707.
(d) Contractor's Release or Waiver of Liens, conditional upon receipt of final payment, submitted in letter form under Contractor's letterhead.
(e) Separate Releases of Waivers of Liens from Subcontractors and Material and Equipment Suppliers.
(f) Guarantees and warranties as set forth in Section 3.5 including all other guarantees required in specific Sections of the Specifications.
(g) Shop drawings, product data, operating and maintenance manuals as set forth in Section 3.12 and these Supplementary Conditions.

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

§ 12.2.1.1 If prior to the date of Substantial completion, the Contractor, a Subcontractor, or anyone for whom either is responsible, uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical devices, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

§ 12.2.1.2 Warranties and guarantees shall become effective on the date of substantial completion as that date is determined by the Architect. This date shall be the date of Substantial Completion. If in the event the Owner accepts a portion of the Work before final completion of the entire Project, then separate warranties shall be issued for specific portions of the Work, after the Architect has determined these areas are substantially complete and a Certificate of Substantial Completion has been issued.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

13.6 NOTICE OF REQUIREMENT: DRUGFREE WORKPLACE

The Contractor certifies to the Owner that the Contractor will provide a drug-free Workplace, as required by applicable law.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

13.7 PROTECTION OF ADJOINING PROPERTY

The Contractor shall be responsible to the Owner for all damages and all injuries to adjoining or near-by lands and /or buildings or to owners thereof and shall replace and make good the same and defend and save the Owner harmless from any and all damages, injuries or claims thereto. Do not allow materials to become airborne and the leave the limits of the site.

13.8 SILT CONTROL

The Contractor shall provide all appropriate barriers and control devices to control silt within the limits of construction of the site and will properly maintain all such devices per all local, state, federal laws and regulations and per good construction practices.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise,

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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

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

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

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

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

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

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

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This draft was produced at 11:27:15 ET on 03/09/2023 under Order No.2114391637 which expires on 12/14/2023, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1365456469)

This page intentionally left blank

SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Requirements including, but not limited to:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Type of Contract.
   4. Work by Owner and under separate contracts.
   5. Access to site.
   6. Coordination with occupants.
   7. Work restrictions.
   8. Construction and sequencing scheduling.
   9. Protection of work and adjacent property.
   10. Owner occupancy
   11. Specification and Drawing conventions.
   12. Construction Schedule.

1.3 PROJECT INFORMATION

A. Project Name: CGD - Turbeville Branch Library

B. Project Location:
   1178 Smith Street
   Turbeville, South Carolina 29162

C. Owner: Clarendon County Administration.

D. Architect: Craig Gaulden Davis / PBK

E. Consultants:
   1. Civil Engineer:
      Steward Engineering
      1416 Saugus Court
      Chapin, South Carolina 29036
      803-716-0772
   2. Structural Engineer:
      Palmetto Structural Engineering
      104 Hunter Hill Circle
      Six Mile, South Carolina 29682
      264-436-8684
   3. HVAC Engineer:
      Stephens Engineering & Consulting
      130 Heritage Lane
      Easley, South Carolina 29642
      864-414-1965
   4. Electrical Engineer:
      Burdette Engineering, Inc.
      200 Regent Park Court
      Greenville, South Carolina 29607

864-297-8717

F. Project Description: The Work of the Project is defined by the Contract Documents, and consists of new construction of a one-story public library for the Town of Turbeville, in Clarendon County, South Carolina.

1.4 WORK COVERED BY THE CONTRACT DOCUMENTS

A. Contract Documents: Contract documents are defined in the General Conditions of the Contract, and include the following:
   1. Drawings as listed on Index.
   2. Specification Sections as listed on Table of Contents in Project Manual.
   3. All addenda issued prior to Bid Opening.

1.5 TYPE OF CONTRACT

A. Project will be constructed under a General Construction Contract (AIA A101).

1.6 WORK BY OWNER AND UNDER SEPARATE CONTRACTS

A. Cooperate fully with Owner so Work may be carried out smoothly, without interfering with or delaying the work or work by Owner. Coordinate the Work with Work performed by Owner.

B. Owner reserves the right to let separate contract for Work outside of the scope of this Contract. Cooperate fully with separate contractors so Work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with Work performed under separate contracts.

C. Purchase Contracts: Owner reserves the right to negotiate purchase contracts with suppliers of material and equipment that may be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
   1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

D. Owner-Furnished, Contractor-Installed Products (OFCI): Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner furnished products and making building services connections when applicable.

E. Owner Furnished Products: Coordinate with Owner.

1.7 ACCESS TO SITE

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

B. Use of Site: Limit use of Project site to Work in areas and areas within the Contract limits indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
   1. Limits:
      a. Drawings indicate the limits of the construction operations.
      b. Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet (12.2 m) beyond building perimeter; 10 feet (3 m) beyond surface walkways, patios, surface parking, and utilities less than 12 inches (300 mm) in diameter; 15 feet (4.5 m) beyond primary roadway curbs and main utility branch trenches; and 25 feet (7.6 m) beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in weathertight condition throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

A. Limited Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
   1. Architect shall prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
   3. Before limited Owner occupancy, ensure mechanical and electrical systems are fully operational, and required tests and inspections and start up procedures are successfully completed. On occupancy, Owner shall operate and maintain mechanical and electrical systems serving occupied portions of Work.
   4. Upon occupancy, Owner shall assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 WORK RESTRICTIONS

A. Work Restrictions: Comply with restrictions on construction operations. Comply with limitations on use of public streets and with other requirements of Authorities Having Jurisdiction (AHJ).

B. On-Site Work Hours: Limit Work in the existing building to normal working hours, Monday through Friday, unless otherwise indicated. Coordinate with Owner when it is necessary to extend working hours or Work on weekends.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than two weeks in advance of proposed utility interruptions.
   2. Obtain Owner’s written permission before proceeding with utility interruptions.

D. Provide a written request a minimum of eight (8) business days in advance when the work may impact occupancy and use of any facility, including systems noted above.

E. Work may not be performed, and materials may not be delivered to the job site during times when the Construction Superintendent is not on site. The Construction Superintendent is defined as a direct employee of the Contractor. This role may not be delegated to a subcontractor.

F. Noise, Vibration, and Odors: Coordinate operations that result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Owner not less than two weeks in advance of proposed disruptive operations.

G. Any work that must be done outside of the designated construction area or phase limit in order to accomplish the Work of the project or phase of the project must have prior written approval from the Owner’s project representative and must be scheduled so as to avoid disrupting the Owner’s operations.

H. Controlled Substances, Firearms, and Explosive Devices: Use of tobacco products, controlled substances, firearms, and explosive devices on the site is not permitted.

I. Employee Identification: Provide identification tags for Contractor personnel working on site. Require personnel to use identification tags at all times.

J. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on site.

1. Maintain list of approved screened personnel with Owner's Designated Representative (ODR).

1.10 CONSTRUCTION AND SEQUENCE SCHEDULING

A. Generally, in order to accommodate the uninterrupted operation of the existing facility during the various phases of construction, the sequence of construction operations shall be as follows:
   1. Make necessary provisions to allow the occupied portions of the facility to function during construction, including provisions for temporary utilities, temporary walkways, erection of temporary barricades and fencing, and the like.
   2. Complete and turn over for occupancy the project or portions of the project, as phased. Unless otherwise specified or specifically approved during construction, work of subsequent phases cannot begin prior to substantial completion of the previous phase.
   3. Upon final completion, Owner acceptance of the project.

B. Some overlapping of construction operations may occur, and where necessary the Contractor may request permission to start certain portions of the work before the previous operations are completed in their entirety. Such detailed scheduling shall be done as the work progresses, provided that the Owner’s operations remain uninterrupted, but in all cases must receive Owner approval.

C. Where it is not possible to complete certain mechanical and electrical services to make the work complete and ready for occupancy, temporary services may be approved to permit occupancy by the Owner at the earliest possible date.

D. Detailed construction scheduling is the responsibility of the Contractor.

1.11 PROTECTION OF WORK AND ADJACENT PROPERTY

A. Buildings and adjacent areas may be subject to damage due to construction operations. At the Completion of the project, the Contractor shall restore existing buildings, landscaping, turf, parking facilities, sidewalks, etc., to the same or better condition as prior to the start of the work.

B. In addition to requirements of the General Conditions of the Contract for Construction, the Contractor shall:
   1. Notify, in writing, the Facilities Operations Representative when equipment or property interferes with the Work and arrange for disposition of such property.
   2. Provide coverings over inlets, area drains, drywells, etc. to prevent soil and construction debris from running into the storm system. In the event of a failure of a covering, the Contractor is required to clean the affected piping and structure(s) prior to substantial completion.
   3. Provide protection from rain, wind, and extreme temperatures to protect new work, materials, equipment, fixtures and adjacent areas from damage.
   4. Provide protection against stormwater back-ups when the storm system is affected by the work. Maintain flows as needed to avoid damage to the work and to surrounding areas.
   5. Provide temporary protection around openings through and at floors, roofs and other openings.

C. The Contractor is required to photograph existing conditions, and to provide photographs in electronic format to the Design Professional and Owner's Representative a minimum of 7 days prior to starting work on site. Sufficient photos with adequate detail to thoroughly document existing conditions shall be provided.

1.12 OWNER OCCUPANCY

A. The Owner reserves the right to occupy and to install equipment in completed areas of the building prior to Substantial completion, provided that such occupancy does not interfere with completion of the work. Such occupancy shall not constitute acceptance of the work.

B. Upon Substantial Completion of the project or portions thereof, the Owner will take occupancy. The Contractor is required to adjust work hours as needed in occupied areas so as to avoid disrupting Owners operations.
   1. Access to the facility and work area will be controlled by the Owner beginning at Substantial Completion. Refer also to the Close Out Procedures section.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: Specifications use certain conventions for style of language and intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in Specifications. The words "shall," "shall be," or "shall comply with," depending on context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of each Specification section.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 CONSTRUCTION SCHEDULE

A. Owner has a critical need for the Work to begin upon Notice to Proceed and shall be Substantially Complete by date as agreed to in the Contract. There will be no Extensions of Time due to weather except in cases of extreme weather (hurricane, tornado, etc.). The impact of each extreme weather event on schedule shall be discussed by the Architect, Owner, and Contractor.

END OF SECTION

This page intentionally left blank

SECTION 01 21 00 - ALLOWANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Unit-cost allowances.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.7 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
   1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
3. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

1. Allowance No. 1: Provide an allowance of $ 15,000 to furnish and install room signs and building mounted letters as specified in Specification Sections 10 14 19 - "Dimensional Letter Signage" and 10 14 23 - "Panel Signage." Allowance shall include all applicable taxes and fees.

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Removal & Replacement of Unsatisfactory Soil Material:
_____ / Cubic Yard

B. Unit Price No. 2: Mass Rock Excavation and Replacement with Satisfactory Soil Material:
_____ / Cubic Yard

C. Unit Price No. 3: Trench Rock Excavation and Replacement with Satisfactory Soil Material:
_____ / Cubic Yard

END OF SECTION

This page intentionally left blank

SECTION 01 23 00 - ALTERNATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Asphalt shingle roof.
   1. Provide a deduct price to furnish and install asphalt shingle roofing, as specified in Specification Section 07 31 13 – “Asphalt Shingles” in lieu of standing seam metal roofing (base bid).

END OF SECTION

This page intentionally left blank

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION

A. Administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Section 01 60 00 - "Product Requirements" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   6. Comply with requirements in Section 01 60 00 - "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 01 21 00 - "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 21 00 - "Allowances" for procedural requirements governing the handling and processing of allowances.
   2. Section 01 22 00 - "Unit Prices" for administrative requirements governing the use of unit prices.
   3. Section 01 26 00 - "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   4. Section 01 32 00 - "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Schedule of Values.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's Project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
   4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site. If required, provide evidence of insurance.
   5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

6. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

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

B. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

D. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored
   1. on-site and items stored off-site.
   2. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
   3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   4. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).

4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.

G. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706.
   5. AIA Document G706A.
   6. AIA Document G707.
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final liquidated damages settlement statement.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

This page intentionally left blank

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.

B. Each trade shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific trade.

C. The Contractor shall make a reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation. Requests for Information (RFIs) will not be allowed from the Contractor. The Contractor shall arrange the necessary meeting in the field with appropriate Architect's field representative(s) to obtain clarification as needed on items that may need interpretation.

1.3 RELATED REQUIREMENTS:

A. Section 01 29 00 - Payment Procedures for submittals associated with this section that are required prior to application for payments.

B. Section 01 32 00 - Construction Progress Documentation for preparing and submitting Contractor's construction schedule.

C. Section 01 73 00 - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

D. Section 01 77 00 - Closeout Procedures for coordinating closeout of the Contract.

1.4 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. RFI.

1.5 SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 PROJECT USE SITE PLAN

A. The General Contractor shall prepare a proposed project use of the site plan.

B. General Contractor shall confine operations at the site to areas within the areas indicated and as approved on the use of the site plan, and as permitted by law, ordinances, and permits. Site shall not be unreasonably encumbered with materials, products, or construction equipment.

C. The General Contractor in reviewing his use of the site shall include access to proposed building for construction purposed, storage of materials and products, parking, where possible, for employees, temporary facilities including offices, storage, and workshop sheds or portable trailers, and unloading space.

D. Where a temporary fence is to be provided, the General Contractor shall show any additional area needed in the General Contractor's use of the site beyond that which may be indicated on the Drawings. Where additional fencing is required, such fencing shall be included at no additional cost to the Owner.

1.7 COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of each part of the Work. Coordinate operations included in different Sections which depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

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

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.
   9. Coordinating inspections and other jurisdictional requirements.
   10. Coordinate OFCI equipment.
   11. Action items and issue logs.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to the Specifications Sections for disposition of salvaged materials that are designated as Owner's property.

1.8 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop

Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade specific information to the coordination drawings by multiple Contractors in sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings:
    1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
    2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures, ductwork, piping, and other components.
    3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire-alarm, and electrical equipment.
    4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
    5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
    6. Mechanical and Plumbing Work: Show the following:
        a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
        b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
        c. Fire-rated enclosures around ductwork.
    7. Electrical Work: Show the following:
        a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
        b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
        c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
        d. Location of pull boxes and junction boxes, dimensioned from column center lines.

e. Floor boxes.

8. Fire Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, sprinkler heads, and inspector test locations.
9. IDF/MDF Rooms: Communications and low voltage (security, data, phone, etc.) audio
10. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
11. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 - Submittal Procedures.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
   1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
   2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
   3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
      a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
      b. Digital Data Software Program: Drawings are available in Revit.
      c. Contractor shall execute a data licensing agreement in the form of AIA Document AIA C106.

1.9 REQUESTS FOR INFORMATION (RFI'S)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, General Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by General Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in General Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of General Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. General Contractor's suggested resolution. If General Contractor’s suggested resolution impacts the Contract Time or the Contract Sum, General Contractor shall state impact in the RFI.
   12. General Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or General Contractor's form if acceptable and approved by the Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following General Contractor-generated RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of General Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for General Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
a. If General Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

E. RFI Tracking Log:
1. Prepare, maintain, and submit a tracking log of RFIs organized by a tracking number. Submit log with not less than the following:
2. Project name.
3. Name and address of General Contractor.
4. Name and address of Architect.
5. Provide sequential tracking numbers including RFIs that were returned without action or withdrawn.
6. RFI description.
7. Date the RFI was submitted.
8. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if General Contractor disagrees with response.
1. Provide identification of related Proposal Requests, General Contractor Initiated Proposals and Construction Change Directives as appropriate.

1.10 TRACKING LOGS – COS, CCDS, PRS, AND ASIS

A. Prepare, maintain, and submit individual tracking logs for Change Orders (COs), Construction Change Directives (CCDs), Proposal Requests (PRs) and Architects Supplemental Instructions ASIs), organized by a tracking number. Submit log with not less than the following:
1. Project name.
2. Name and address of General Contractor.
3. Name and address of Architect.
4. Provide sequential tracking numbers.
5. Item description.
6. Date the item was submitted for review.

7. Date Architect's response was received.
8. Date the item was revised if applicable.
9. The tracking number shall remain part of the log even if the item was deemed to be denied or un-needed.
10. Provide documentation of the links and progressions of related CDs, CCDs, PRs and ASIs as appropriate.
11. The PR log shall list all items which may become a CD at a later date but have not yet been approved.
12. The CCA log shall also contain contingency logs for the Owner's and General Contractor's which includes initial amounts, approved revisions, and remaining balances in each contingency.
13. Update the logs and distribute the response to affected parties.

1.11 TRACKING LOG – VALUE ENGINEERING

A. Prepare, maintain, and submit a tracking log for value engineering items organized by a tracking number. Submit log with not less than the following:
   1. Project name.
   2. Name and address of General Contractor.
   3. Name and address of Architect.
   4. Provide sequential tracking numbers.
   5. Item description.
   6. Date the item was submitted for review.
   7. Date Architect's response and Owner's approval was received.
   8. Date the item was revised if applicable.
   9. The tracking number shall remain part of the log even if the item was deemed to be denied.
   10. Update the logs and distribute the response to affected parties.

1.12 PROJECT MEETINGS

A. Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Architect to prepare the meeting agenda and distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
   4. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.
   5. Issue logs: Documentation element of software project management and contains a list of ongoing and closed issues of the project.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that affect progress.
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.

d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for Architectural Supplemental Instruction.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of record documents.
n. Use of the premises and existing building.
o. Work restrictions.
p. Working hours.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.
aa. Sustainable design requirements
bb. Owner's occupancy requirements.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
5. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

C. Preinstallation Conferences: Conduct a preinstallation trade conference at site before each construction activity that requires coordination with other construction trades.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. List of Required Preinstallation Meetings: See Specification Section 01 33 00.1 Submittal Register.
3. Agenda: Contractor to review progress of other construction activities and preparations for the particular activity under consideration.
   a. Contract Documents
      1) Drawing Revisions.
      2) Related RFIs.
      3) Related Change Orders.
      4) Value Engineering.
      5) Options.
   b. General Conditions
      1) Submittals.
      2) Manufacturer's written instructions.
      3) Testing and inspecting requirements.
      4) Coordination with other work.
      5) Weather limitations.
      6) Deliveries.

7) Time schedules.
8) Required performance results.
9) Compatibility requirements.
10) Regulations of authorities having jurisdiction.

c. Products
1) Primary items indicated in specifications.
2) Accessory items listing in specifications.

d. Execution
1) Protection of adjacent work.
2) Protection of construction and personnel.
3) Possible conflicts.
4) Temporary facilities and controls.
5) Space and access limitations.
6) Review of mockups
7) Installation procedures.
8) Acceptability of substrates.
9) Installation of primary items indicated in specifications.
10) Installation of accessory items listing in specifications.

4. Contractor to record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
5. Reporting: Contractor to distribute minutes of the meeting to each party present and to other parties requiring information.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
7. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Substantial Completion.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout.
a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of General Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.

m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
5. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Status of sustainable design documentation.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Progress cleaning.
      11) Quality and work standards.
      12) Status of correction of deficient items.
      13) Field observations.
      14) Status of RFIs.
      15) Status of proposal requests.
      16) Pending changes.
      17) Status of Change Orders.
      18) Pending claims and disputes.
      19) Documentation of information for payment requests.
      20) Tracking logs.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
   b. Six (6) week look-ahead schedules.
5. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

F. Coordination Meetings: Conduct coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: In addition to representatives of Owner and Architect, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each Contractor present.
   3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
   4. Action Items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. General Contractor’s Construction Schedule.
   3. Submittals Schedule.
   4. Daily construction reports.
   5. Bi-Weekly Construction reports.
   6. Field condition reports.
   7. Special reports.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Activity:
      a. Critical Activity.
      b. Predecessor Activity.
      c. Successor Activity.
   2. Cost Loading.
   3. Critical Path.
   4. Critical Path Method (CPM).
   5. Float.
   6. Look-Ahead Schedule.
   7. Milestones.
   8. Recovery Schedule.
   9. Resource Loading.

1.4 ACTION SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.

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

C. Preliminary Construction Schedule: Submit three (3) printed copies; one, a single sheet of reproducible media, and two prints.

D. Preliminary Network Diagram: Submit three (3) printed copies; one, a single sheet of reproducible media, and two prints; large enough to show entire network for entire construction period.

E. Contractor's Construction Schedule: Submit three (3) printed copies of initial schedule, one a reproducible print and two blue- or black-line prints, large enough to show entire schedule for entire construction period.

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

G. Daily Construction Reports: Submit two (2) copies at weekly intervals.

H. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.

I. Special Reports: Submit two (2) copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Pre-Scheduling Conference: Conduct conference at site. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
   1. Review software limitations and content and format for reports.
   2. Verify availability of qualified personnel needed to develop and update schedule.
   3. Discuss constraints, including phasing, Work stages, area separations, interim milestones, and partial Owner occupancy.
   4. Review delivery dates for Owner furnished products.
   5. Review schedule for Work of Owner's separate contracts, if any.
   6. Review submittal requirements and procedures.
   7. Review time required for review of submittals and re-submittals.
   8. Review requirements for tests and inspections by independent testing and inspecting agencies.
   9. Review time required for Project closeout and Owner startup procedures.
   10. Review and finalize list of construction activities to be included in schedule.
   11. Review procedures for updating schedule.

1.6 COORDINATION

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

PART 2 PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time is of the essence to the Owner. Commence Work immediately upon issuance of the Notice to Proceed. There is a critical need for the Work to be substantially complete within the time frame identified in the Agreement.

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion and date of final completion.
   1. Contract completion date shall not be changed by submission of schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each separate area or story as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities in terms of number of days anticipated.
   2. 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.
   3. Submittal Review Time: Include review and re-submittal times indicated in Section 01 33 00 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Startup and Testing Time: Include number of days anticipated for startup and testing.
   5. Substantial Completion: Indicate completion of all conditions as in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   6. Punch List and Final Completion: Include a maximum of 30 days for completion of punch list items and final completion.
   7. Inspections required by Authorities Having Jurisdiction (AHJ).

D. Constraints: Include constraints and Work restrictions indicated in the Contract Documents and show how the sequence of the Work is affected.
   1. 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.
   2. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.
      e. Use of premises restrictions.
      f. Provisions for future construction.
      g. Seasonal variations.
      h. Environmental control.
      i. Rain days are to be included in project schedule; refer to Section 01 10 00 - Summary for additional weather information.
   3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.

4. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Substantial Completion.
   f. Final Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, interim milestones indicated below, Substantial Completion, and Final Completion.
   1. Pre-construction Conference.

F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
   1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

G. Six (6) week, lookahead schedule: Prepare schedule indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and Contract Time.
   6. Inspections by Authorities Having Jurisdiction (AHJ).
   7. Trade pre-installation conference.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

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

K. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   1. Identification of activities that have changed.
   2. Changes in early and late start dates.
   3. Changes in early and late finish dates.
   4. Changes in activity durations in workdays.
   5. Changes in the critical path.
   6. Changes in total float or slack time.
   7. Changes in the Contract Time.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

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

B. Preliminary Network Diagram: Submit diagram within ten (10) days of date established for Notice of Award. Outline significant construction activities for the first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
   1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than thirty (30) days after date established for the Notice of Award.
   2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
   3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
   4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      a. Preparation and processing of submittals.
      b. Mobilization and demobilization
      c. Utility interruptions
      d. Purchase of materials.
      e. Delivery.
      f. Fabrication.
      g. Installation.
      h. Work by Owner that may affect or be affected by the Contractor's activities.
      i. Punch list and final completions
      j. Tests and inspections
      k. Startup and placement into final use and operation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording information concerning events at the site and submit each month to Architect:
1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Rental equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).

B. Monthly Construction Reports: Prepare a monthly construction report recording the following information concerning events at the Project Site.
1. Stoppages, delays, shortages, and losses.
2. Meter readings and similar recordings.
3. Emergency procedures.
4. Orders and requests of Authorities Having Jurisdiction (AHJ).
5. Change Orders received and implemented.
6. Construction Change Directives received and implemented.
7. Services connected and disconnected.

8. Equipment or system tests and startups.
9. Partial completions and occupancies.
10. Substantial Completions authorized.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

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

2.6 SPECIAL REPORTS

A. Submit special reports directly to OwnerOwner within 24 hours of an occurrence. Distribute copies of report to parties affected by the occurrence.

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

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with a pencil copy of pay application.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) day before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and interested parties identified by Contractor with a need to know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.

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

END OF SECTION

SECTION 01 33 00.0 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Section Includes: Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Partial submittals without prior approval or incomplete submittals will be returned without review.
   1. Prior approval from the Architect shall be obtained for partial submittals prepared for a specific product submittal.

C. Submittals will be deemed complete if all items required in the submittal sections of the subject specification section have been assembled into a single submittal package.

D. Submittals will not be accepted for review until the Schedule of Submittals, per article 1.4 has been submitted to the Architect.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Submittals.
   2. File Transfer Protocol (FTP).
   3. Portable Document Format (PDF).

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by date required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, schedule of values, and the Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals concurrently with each construction schedule update.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal category: Action; informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled date of fabrication.
      h. Scheduled dates for purchasing.
      i. Scheduled dates for installation.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. The Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by the Architect for the Contractor's use in preparing submittals.
   1. Upon request, the Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
      a. The Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Digital Drawing Software Program: Contract Drawings are available in Revit.
      c. Contractor shall execute a data licensing agreement in the form of AIA Document AIA C106, Digital Data Licensing Agreement.
      d. The following digital data files will by furnished for each appropriate discipline:
         1) Floor plans.
         2) Reflected ceiling plans.
      e. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
         1) File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals. Time for review shall commence on the Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow ten (10) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process in same manner as initial submittal.
   3. Resubmittal Review: Allow ten (10) days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to the Architect and to the Architect's consultants, allow ten (10) days for review of each submittal. Submittal will be returned to the Architect before being returned to the Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier:

a. File name shall use Project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., SLOHSM-06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., SLOHSM-06 10 00.01.A).

3. Provide means for insertion to permanently record the Contractor's review and approval markings and action taken by the Architect.
4. Transmittal Form for Electronic Submittals: Use software generated form from electronic project management software acceptable to Owner, containing the following information:
   a. Project name.
   b. Name and address of the Architect.
   c. Name of the Contractor.
   d. Name of the Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
   j. Specification paragraph number or drawing designation and generic name for each of multiple items.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Indication of full or partial submittal.
   o. Transmittal number, numbered consecutively.
   p. Submittal and transmittal distribution record.
   q. Other necessary identification.
   r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

E. Options: Identify options requiring selection by the Architect.

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

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

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

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Certificates and Certifications Submittals: Provide statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in PDF electronic file.

C. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Sheet Size: Except for templates, patterns, and similar full size drawings, submit Shop Drawings on sheet size indicated in specification section.
   3. Submit Shop Drawings in PDF electronic file.
   4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.

a. Prepare Shop Drawings in same digital data software program, version, and operating system as the original Drawings.
b. Refer to Section 01 31 00 - Project Management and Coordination for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of the Contractor.
5. Samples: Submit full size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
a. Key Items Review Time: Submit samples to the Architect at least 30 days prior to date Contractor needs reviewed submittals returned. The Contractor shall be prepared to submit color samples on any key items in Division 09 finishes within 30 days of the award of Contract. Once samples of all key items are received, the Architect will finalize color selections.
b. Number of Samples: Submit three sets of Samples. The Architect will retain two Sample sets; remainder will be returned.
1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by the Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

4. Location within room or space.
5. Submit product schedule in PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 - Project Management and Coordination.

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 - Construction Progress Documentation.

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 - Payment Procedures.

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 - Quality Requirements.

J. Closeout Submittals required for Substantial Completion: Comply with requirements specified in Section 01 77 00 - Closeout Procedures.

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 - Operation and Maintenance Data.

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

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

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

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

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

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

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

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

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

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

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

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

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

2.2 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of the Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to the Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to the Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM File Incorporation: Incorporate delegated design drawing and data files into Building Information Model established for Project.
   1. Prepare delegated design drawings in the same digital data software program, version, and operating system as the original Drawings.

D. Project Closeout and Maintenance Material Submittals: See requirements in specification section "Closeout Procedures."

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

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

B. Project Closeout and Maintenance Material Submittals: See requirements in specification section "Closeout Procedures."

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

3.2 ARCHITECT'S ACTION

A. Submittals: The Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. The Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
   1. Reviewed: Indicates the Architect has reviewed the submittal and takes no exceptions as submitted.
   2. Rejected: Work covered by the submittal is not complete or does not conform the Contract Documents and cannot proceed. A new submittal needs to be made according to the notations and resubmitted for approval prior to fabrication or construction.
   3. Revise and Resubmit: Modifications are required prior to approval. Work cannot proceed until the submittal is revised and resubmitted for further review.
   4. Furnish as Corrected: Submittal is approved, provided modifications noted are properly incorporated. Resubmission is not usually necessary.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from the Architect.

C. Incomplete submittals are not permitted, will be considered non-responsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents will be returned by the Architect without action.

END OF SECTION

DIGITAL DATA RELEASE FORM

Project:	{Insert Project Name}	**Date:**	MM/DD/YYYY
Project Number:	12345	**Contractor:**	{Insert Contractor Name} {Insert Contractor's Address} {Insert Contractor's Address}
Architect of Record:	PBK {Insert Office Address} {Insert Office Address}		

Digital Data refers to electronic representation of information, drawings, and designs created and stored in digital form including Building Information Modeling (BIM) files, CAD files, and other formats that are digital representations of the project. PBK will provide the following {Revit / CAD} dated {MM/DD/YYYY} for the convenience of the Contractor after purchase of the building.

Digital Data were prepared on the following:

Computer Hardware/Operating System – {Microsoft Windows 10}
Software Application and Version – {type here}

Contractor shall pay PBK a service fee of $00.00.

TERMS & CONDITIONS

1. PBK makes no representation as to the compatibility of the Digital Data with any hardware or software.
2. Since the information set forth on the Digital Data can be modified unintentionally or otherwise, Harvard Jolly | PBK reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
3. All information on the digital data is considered Instruments of Service of PBK and shall not be used for other projects, for additions to this project, or completion of this project by others. The Digital Data shall remain the property of PBK and in no case shall the transfer of these files be considered a sale.
4. PBK makes no representation regarding the accuracy, completeness, or permanence of the Digital Data, or for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the Digital Data may not have been incorporated. In the event of a conflict between Harvard Jolly | PBK's sealed contract drawings and the Digital Data, the sealed contract drawings shall govern. It is the Contractor's responsibility to determine if any conflicts exist. The Digital Data shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
5. The use of Digital Data prepared by PBK shall not in any way obviate the Contractor's responsibility for the proper checking and coordination of dimensions, details, and quantities of materials as required to facilitate complete and accurate fabrication and erection.
6. The Contractor shall, to the fullest extent permitted by law, indemnify, defend, and hold harmless PBK and its consultants from all claims, damages, losses, expenses, penalties, and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the Digital Data by the Contractor, or by third party recipients of the Digital Data from the Contractor.
7. PBK believes that no licensing or copyright fees are due to others on account of the transfer of the Digital Data, but to the extent any are, the Contractor will pay the appropriate fees and hold PBK harmless from such claims.
8. Payment of the service fee is due upon receipt of the Digital Data.

_____	_____
Name & Title (Architect)	Name & Title (Contractor)
_____	_____
Signature Date	Signature Date

This page intentionally left blank

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
   3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
   4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Experienced.
   2. Installer/Applicator/Erector.
   3. Mockups.
      a. Laboratory Mockups.
      b. Integrated Exterior Mockups.
      c. Room Mockups.
   4. Quality Assurance Services.
   5. Quality Control Services.
   6. Testing:
      a. Field Quality Control Testing.
      b. Preconstruction Testing.
      c. Product Testing.
      d. Source Quality Control Testing.
   7. Testing Agency.

B. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply

with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Submit plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 CONSTRUCTION MANAGER'S QUALITY-CONTROL PLAN

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting Work on the following systems:
   1. Seismic force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by Architect.
   2. Main wind force resisting system or wind resisting component listed in the wind force resisting system quality assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality control service.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

E. Trade Preinstallation Conferences: Meeting minutes to be Contractor provided.

1.8 QUALITY ASSURANCE

A. Qualifications establish the minimum qualification levels required; refer to individual Specification Sections for additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated and sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated and with record of successful in service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling Work similar in material, design, and extent to that indicated for this Project, whose Work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of South Carolina, experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to

ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products.

I. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit certified written report of each test, inspection, and similar quality assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect a minimum of seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting Work, fabrication, or construction. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Mockup of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies shall be constructed. Mockup, if not specifically shown on the drawings, shall be minimum 8 ft by 8 ft. Mockup shall include all major façade elements and at least one window minimum 2 ft by 2 ft in size. Prior to constructing mockup verify requirements with architect. Pre-installation conferences for trades involved in Integrated Exterior Mockup shall be held after mock up is completed.

M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

N. Trade Preinstallation Conferences: Meeting minutes to be Contractor provided.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner shall engage a qualified testing agency to perform the services.
   1. Owner shall furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 31 00 - Project Management and Coordination.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner shall engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner:

B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections.
1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION

This page intentionally left blank

SECTION 01 41 00 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 CODE REQUIREMENTS

A. Perform all work on this Project in strict accordance with, but not limited to, applicable requirements and portions of the latest adopted editions of the currently adopted codes, revisions, amendments, supplements, and their references.

International Building Code, 2018 Edition.
International Plumbing Code, 2018 Edition.
International Mechanical Code, 2018 Edition.
International Fire Prevention Code, 2015 Edition.
International Energy Conservation Code, 2012 Edition.
National Electrical Code, 2017 Edition.

1. National Fire Protection Association:
   a. NFPA 1 2021 and NFPA101 2021 with applicable amendments.
   b. NFPA 80 – Standard for Fire Doors and Fire Windows.
   c. NFPA 70 - National Electric code.
2. Accessibility:
   a. U.S. Department of Justice, Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
   b. U.S. Access Board, Americans with Disabilities Act Architectural Guidelines (ADAAG), Accessibility Guidelines for Buildings and Facilities.
   c. U.S. Access Board, Americans with Disabilities Act Architectural Guidelines (ADAAG), accessibility requirements for children, July 23, 2004.
   d. Accessible and Usable Buildings and Facilities, ICC/ANSI A A117.1, 2017 Edition.
3. American Society of Civil Engineers – ACSE 7:
   a. Minimum Design Loads for Buildings and Other Structures.
   b. Minimum Finished Floor Elevations: The Contractor shall furnish the county with a signed and sealed "Flood Elevation Certificate" certifying compliance of the finished floor elevations for all new construction.
   c. ASCE 7-16 Seismic Design Categories Reference Information, Seismic Design Category D (SDC D).

1.3 CODE STANDARDS

A. All work shall conform to applicable portions of the adopted, or the latest edition of the standards listed, which shall include, but is not limited to, the following:
   1. Aluminum Association (AA).
   2. American Association of Automatic Door Manufacturers (AAADM).
   3. American Concrete Institute (ACI).
   4. American Institute of Steel Construction (AISC).
   5. American National Standards Institute (ANSI).
   6. American Society for Testing and Materials (ASTM).
   7. American Society of Mechanical Engineers (ASME).
   8. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
   9. American Welding Society (AWS).
   10. Architectural Woodworking Institute (AWI).
   11. Architectural Aluminum Manufacturer's Association (AAMA).

12. Commercial Standards (CS).
13. Federal Specifications and Standards (FSS).
14. Global Standards: International Organization for Standardization (ISO); ISO 9001 -Quality Management Systems.
15. National Occupations Safety and Health Administration (OSHA).
16. National Institute for Standards and Technology (NIST).
17. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA), Metal Finishes Manual for Architectural and Metal Products.
18. Underwriter's Laboratories (UL).
19. U.S. of America Standards Institute (ASI).
20. U.S. Department of Commerce Product Standards (USDCPS).

1.4 REFERENCE STANDARDS

A. Comply with applicable portions of the Referenced Standards listed in the International Building Code and NFPA 1, Chapter 2 including but not limited to AAMA, ACI, AISC, ANSI, ASCE, ASHRAE, ASTM, FM, GA, OSHA, SJI, USGBC, ADA, IES, and UL standards.

1.5 CODE DISCREPANCIES

A. In case of discrepancy between the codes, standards, and specifications listed, the strictest or most stringent requirement shall govern.

1.6 COMPLIANCE WITH CODES

A. A permit issued will be construed as permission to proceed with construction, and not as authority to violate, cancel, alter, or set aside any of the provisions of any Codes.

B. Nor shall issuance of a permit prevent the Owner from thereafter requiring a correction of errors in plans, construction, or violations of any Codes.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 42 00 - REFERENCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 DESCRIPTION OF WORK REQUIREMENTS

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

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

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Approved.
   2. Directed.
   3. Furnish.
   4. Indicated.
   5. Install.
   6. Provide.
   7. Regulations.
   8. Testing Agencies.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference. Individual Specification Sections indicate which codes and standards the Contractor must keep available at the project site for reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

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

D. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified is intended to be the minimum for the Work to be provided or performed. Unless otherwise indicated, the actual Work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are either minimum or maximum values, as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to the Architect for decision before proceeding.

1.5 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the trade association, standards-

producing organization, authorities having jurisdiction or other entity applicable to the context of the text provision.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the Agency.

C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

1.6 SUBMITTALS

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 42 16 - DEFINITIONS

PART 1 GENERAL

1.1 CONTRACTING DEFINITIONS

A. General: Basic Contract definitions include:
   1. Change Order.
   2. Construction Change Directive.
   3. Contract Documents.
   4. Contract.
   5. Drawings.
   6. Instruments of Service.
   7. Initial Decision Maker.
   8. Project.
   9. Specifications.
   10. Subcontractor.
   11. Substantial Completion.

B. Miscellaneous Other Definitions
   1. Addenda, Addendum.
   2. Alternate Proposal(s).
   3. Approved, Approved Equivalent, Approved Equal, or Equal.
   4. Base Proposal.
   5. Contract Time.
   6. Date of Agreement.
   7. Date of Commencement of the Work.
   8. Date of Final Completion.
   9. Notice to Proceed.
   10. Provide.
   11. Punch List.
   12. Unit Prices.

1.2 DEFINITIONS

A.
   1. AAADM: American Association of Automatic Door Manufacturers.
   2. Accessible: In accordance with the accessibility standard.
   3. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
   4. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
   5. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
      a. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
      b. Predecessor Activity: An activity that precedes another activity in the network.
      c. Successor Activity: An activity that follows another activity in the network.
   6. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

7. Adaptable Laboratory Furniture System: Modular furniture assemblies consisting of individual components, including: support structures; cabinets and storage units; worksurfaces; shelving; accessories.
8. Adequate Ventilation: Ventilation, including air circulation and air changes, required for curing materials, dissipate humidity, and prevent accumulation of dust fumes, vapors, or gases.
9. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
10. AESS: Refer to Architecturally-Exposed Structural Steel.
11. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
12. Alteration Work: Remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
13. Alternate: An amount proposed by bidders and stated on the Bid Form for certain Work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
    a. Alternates described are part of the Work when enumerated in the Agreement. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
14. Anchorage Connector: A component or subsystem that functions as an interface between the anchorage and a fall protection, work positioning, rope access, or rescue system for the purpose of coupling the system to the anchorage.
15. Architectural Woodwork: Custom millwork that includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.
16. Architecturally-Exposed Structural Steel (AESS): Structural steel complying with designated AESS category as defined in AISC 303.
    a. Category 1 AESS: AESS that is within 96 inches vertically and 36 inches horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.
    b. Category 2 AESS: AESS that is within 20 feet vertically and horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 2 architecturally exposed structural steel" or "AESS-2" in the Contract Documents.
    c. Category 3 AESS: AESS that is not defined as Category 1 or Category 2 or that is designated as "Category 3 architecturally exposed structural steel" or "AESS-3" in the Contract Documents or that is indicated to receive intumescent mastic fireproofing.
17. Approved: The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

B.

1. Basis of Design (BOD) (Document): A document that records the concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

2. Basis of Design (BoD) (Product): A product around which the project has been designed. If a product other than the Basis of Design is provided, it must be coordinated with Architect.
3. Basis of Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "Basis of Design Product", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers named in the specification.
4. Bio-Based Material: Commercial or industrial products (other than food or feed) that are composed in whole, or in significant part, of biological products, renewable agricultural materials (including plant, animal, and marine materials), or forestry materials. For the purposes of LEED, this excludes leather and other animal hides.
5. Boards or Strips: Lumber of less than [2] inches ([50.8] mm) nominal size in least dimension.

C.

1. Casework: Products including, but not limited to framework, doors, drawers, hardware, and finishes which constitute cabinets and cases.
    a. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches (762 mm) above finished floor.
    b. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches (1.066 m) above finished floor, tops of cases less than 72 inches (1.82 m) above finished floor and all members visible in open cases or behind glass doors.
    c. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches (1.828 m) above finished floor and bottoms of cabinets more than 30 inches (0.762 m) but less than 42 inches (1.066 m) above finished floor.
2. Cast Stone: Refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
    a. Dry Cast Concrete Products: Manufactured from zero slump concrete:
        1) Vibrant Dry Tamp (VDT) casting method - Vibratory ramming of earth moist, zero slump concrete against a rigid mold until densely compacted.
    b. Wet Cast Concrete Products: Manufactured from measurable slump concrete:
        1) Wet casting method - Manufactured from measurable slump concrete and vibrated into a mold until densely consolidated.
3. Certified Wood: Wood based materials and products certified in accordance with Forest Stewardship Council’s (FSC) Principles and Criteria for wood building components.
4. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body. A chain-of- custody certification is not required by distributors of a product that is individually labeled with the Forest Stewardship Council logo and manufacturer’s chain of custody number. Chain of Custody certification requirements are determined by Forest Stewardship Council Chain of Custody Standard 40-004 v2-1.
5. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
6. CMU: Concrete Masonry Veneer Unit.
7. Commissioning (Cx): A systematic process confirming that building systems have been installed, properly started, and consistently operated in strict accordance with the Project Documents, that all systems are complete and functioning in accordance with the Contract Documents at Substantial Completion, and the Contractor has provided the Owner adequate system documentation and training.

8. Commissioning Authority (CxA): Party having a contractual agreement with the Owner to provide third party commissioning services as defined herein under Commissioning Authority's Role and Responsibilities. Commissioning Authority may represent the Owner and is authorized to act on behalf of the Owner. The Commissioning Authority does not have authority to alter design or installation procedures without the written approval of the Owner or the design team.
9. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a produce substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
10. Composite Materials: Materials made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce materials with characteristics different from the individual components.
11. Composite Wood (also referred to as "Engineered Wood"): Examples of Composite Wood are: particleboard; flake-board; plywood; fiberboard; MDF; agrifiber products; millwork substrates; flooring substrates; equipment backboards; door cores.
12. Concealed Portions of Casework: Include panels and other surfaces not usually visible after installation.
13. Consolidate: To strengthen loose or deteriorated materials in place.
14. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
15. Containment Areas: As determined by Owner's Representative and as shown on drawings. Includes area of construction, adjacent staging and storage areas, for contractors, supplies and waste: includes ceiling spaces above and adjacent to construction, if shown.
16. Contaminant Producing Activities: Activities that include, but are not limited to:
    a. Demolition and removal of walls, floors, ceilings, and other finish materials.
    b. Demolition of plumbing, mechanical and electrical systems and equipment.
    c. Finish operations such as sanding, painting, and application of special surface coatings.
    d. All routine construction activity which can generate dust.
    e. Sitework operations.
17. Contract Documents: The General Conditions, Drawings, Specifications, Addenda, and other documents developed by the A/E Team and approved by the Owner that constitute the contractual obligations of the project scope.
18. Control Point and Sensor Calibration Verification: Process of verifying the point integrity and/or sensor calibration from the physical point of monitoring (sensor, contact, actuator, etc.) to the digital point location at the Operator's interface within the respective control system (Building Automation, Lighting Controls, Power Status and Monitoring, etc.).
19. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
20. Cradle-to-Gate Assessment: Analysis of a product's partial life-cycle from extraction (cradle) to gate (factory completion prior to distribution).
21. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
22. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
23. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

24. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

D.

1. Deconstruct: To remove by disassembling or detaching an item from a surface, using methods and equipment to successfully prevent damage to the item and surfaces, and dispose of items unless indicated as salvaged or for reinstallation.
2. Deferred Testing: Functional Performance or Integrated System Tests performed after Substantial Completion due to partial occupancy, partial equipment acceptance, seasonal requirements, design, or other site conditions that prohibit the test from being performed prior to Substantial Completion.
3. Deficiency: Condition of a component, piece of equipment, or system that is not in compliance with the Project Documents.
4. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
5. Design Reference Sample: A sample that represents the Architect's prebid selection of Work to be matched; it may be existing Work or Work specially produced for the Project.
6. Dimensions: All unit sizes are shown as Nominal Dimensions.
7. Dimension Lumber: Lumber of [2] inches ([50.8] mm) nominal or greater size but less than [5] inches ([127] mm) nominal size in least dimension.
8. Directed: A command or instruction by Architect. Other terms including "requested," "authorized", "selected", "required", and "permitted" have the same meaning as "directed."
9. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; Disposing of items unless indicated to be salvaged or reinstalled.
10. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
11. Double-Egress (Doors): A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.
12. Double-Swing (Doors): A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.
13. Drainable Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E.

1. Engineered Wood: Refer to Composite Wood.
2. Equipment: A product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.
3. Event: The starting or ending point of an activity.
4. Existing to Remain: Leave existing items that are not scheduled for salvage or reuse, as is; Do not remove.
5. Experienced: When used with an entity or individual, experienced means having successfully completed a minimum of five years documented experience with projects similar in nature, size, and extent; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
6. Exposed Portions of Casework: Bottoms of casework more than two feet above floor shall be considered as exposed. Visible members in open cases also shall be considered as exposed portions.

F.

1. Face Size: Actual tile size, excluding spacer lugs.

2. Fall Arrest System: A system designed to stop you in the process of a fall, typically including an anchor point or series of anchor points, a safety lanyard or self-retracting lifeline, and a harness.
3. Fall Protection System: System can be either a fall arrest or a fall restraint system.
4. Fall Restraint System: A system designed to keep you from getting close enough to the fall hazard to fall, typically including an anchor point or series of anchor points, a safety lanyard or self-retracting lifeline, and a harness.
5. Fiber-Reinforced Polymer (FRP): Material that consists of polymer resin-based matrix with fibers of either glass, carbon or aramid, and hybrid combinations of these fiber types.
6. Field Quality Control Testing: Tests and inspections performed onsite for work scheduled to be performed and upon completed Work.
7. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
8. Float: The measure of leeway in starting and completing an activity.
    a. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
    b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
    c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
9. Formaldehyde: Naturally occurring VOC, found in small amounts in animals and plants; carcinogenic and irritant to humans when present in high concentrations. (Levels above 0.1 ppm).
    a. Urea Formaldehyde: Combination of urea and formaldehyde, used in glue, and readily decomposes at room temperature.
    b. Phenolformaldehyde: Type of formaldehyde that off gasses only at high temperature; used for exterior products and suitable for interior applications.
10. Forest Stewardship Council (FSC) Certified Content: Permanently installed wood content that has been harvested in accordance from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Recycled wood fiber that qualifies as contributing to MR Credit 4 (Recycled Content) is excluded from FSC Certified Content.
11. Furnish: The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
12. Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems executed by the Contractor and witnessed by the CxA. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, life safety conditions, power failure, etc. Systems are operated through all specified sequences of operation. Components are verified to be responding in accordance with requirements in the Project Documents.
13. Functional Performance Testing Procedures: Commissioning protocols, detailed test procedures and instructions in tabular and script-type format that fully describe system configuration and steps required to determine if the system is performing and functioning properly.
14. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G.

1. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

2. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
3. General: Considering or including the main features or elements of something, and disregarding exceptions; overall.
4. General Emissions Evaluation: To comply with low-emitting material criteria, building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2–2017mg/, using the applicable exposure scenario. Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.2: 0.5 mg/m3 or less; between 0.5 and 5.0 mg/m3; or 5.0 mg/m3 or more.

H.

1. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
2. Hazardous Materials: Material regulated as hazardous material in accordance with 49 CFR 173, requiring Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation, or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Hazardous material includes hazardous chemicals.
3. Hazardous materials include but are not limited to pesticides, biocides, and carcinogens listed by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC) and recognized authorities.
4. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

I.

1. IBC: International Building Code.
2. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown", "noted", "scheduled", and "specified" have the same meaning as "indicated."
3. Indoor Air Quality (IAQ): Composition and characteristics of air in an enclosed space affecting occupants of space. The indoor air quality refers to relative quality of air in a building with respect to contaminants and hazards and is determined by levels of indoor air pollution and characteristics of air, including those that impact thermal comfort such as air temperature, relative humidity, and air speed.
4. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
5. Integrated Systems Test (IST): Test of dynamic function and operation of multiple systems. Integrated Systems Tests are tested under various modes, such as fire alarm and emergency situations, life safety conditions, power failure, etc. Systems are integrally operated through all specified sequences of operation. Systems and interconnections are verified to be responding in accordance with the requirements in the Project Documents.
6. Integrated Systems Testing Procedures: Commissioning protocols and detailed test procedures and instructions in tabular and script-type format that fully describe system configurations and steps required to determine if the interacting systems are performing and functioning properly.
7. Interior Final Finishes: Materials and products exposed at interior, occupied spaces including flooring, wallcovering, finish carpentry, and ceilings.

8. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
9. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operations, including installation, erection, application, and similar operations.
    a. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
    b. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
    c. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
        1) This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work.
10. Interior (of Building): Within the weatherproof membrane.
11. Interspace: Space between lites of an insulating-glass unit.

J.

N/A

K.

1. Knowing act: Consciously initiating the opening of a power operated door using acceptable methods including wall mounted switches such as push plates and controlled access devices such as keypads, card readers and key switches.

L.

1. Lead Equivalence: The thickness of lead that provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions.
2. Leadership in Energy and Environmental Design (LEED): USGBC's Building Rating System
    a. Refer to the applicable LEED Reference Guide for additional definitions.
3. LEED Online: GBCI’s online portal for project certification documentation.
4. LEED Project Administrator: Responsible for administration of LEED Certification Application.
5. Life-Cycle Inventory: Database that defines environmental input and output for each step in a material or assembly's life cycle.
6. Lifeline: A component of a fall protection system consisting of a flexible line designed to hang vertically, a vertical lifeline, or connecting to anchorages or anchorage connectors at both ends to span horizontally, a horizontal lifeline.
7. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.
8. Look-Ahead Schedule: Prepare schedule indicating activities scheduled to occur or commence prior to submittal of next schedule update.
9. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

M.

1. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
2. Materials: Products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form units of work.
3. MERV: Minimum Efficiency Reporting Value: Arrestance rating of filter at three MERV Rating Explanation particle sizes of 0.3 microns to 10 microns at a determined face velocity.
4. Milestones: measurable and observable and serve as progress markers (flags) but, by definition, are independent of time (have zero durations) therefore no work or consumption of resources is associated with them.
5. Millwork: Ready-made wood products manufactured at a wood-planing mill or woodworking plant: moldings, doors, door frames, window sashes, stair work, cabinets, etc. excluding flooring, ceilings, and sidings.
6. Minimum Thickness: Minimum thickness of base metal without coatings.
7. “Minor” ceiling access is defined as visual observation or minor adjustments or other activity that does not disturb dust. Acoustical panels shall be replaced or access panel shall be closed immediately when the contractor leaves the work site.
    a. “Major” ceiling access describes any other access not defined as “minor”.
8. Mobile Cabinet: Free-standing base cabinet storage device mounted on casters or glides.
9. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
    a. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
    b. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
    c. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
10. Module Size: Actual tile size plus joint width indicated.

N.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. Negative Air Machine: Portable mechanical units to provide a negative air pressure in the Containment Areas.
3. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
4. Non-Hazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
5. Non-Toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

O.

1. Operational Testing: Activities and testing occurring after initial energizing and/or start-up of equipment that determine whether equipment is operating within the manufacturer's recommendations and the design requirements. These activities are intended to ensure that equipment and systems meet all warranty requirements and are ready for Functional Performance Testing. Common examples are Testing, Adjusting and Balancing of HVAC systems and initial load testing of electrical equipment.
2. Owner's Designated Representative (ODR): Owner's representative, or its duly authorized representative, who will provide the general administration of this Agreement for Projects on behalf of Owner and shall be Owner's field representative in all matters related to this Agreement, including keeping Owner's procurement personnel informed at all times of the adequacy of Supplier's performance and progress, except as may be otherwise provided herein. Owner may, at its sole discretion, change its Designated Representative at any time or from time to time, and shall promptly notify Supplier, in writing, of any such change.
3. Owner's Project Requirements (OPR): A written document that details the functional requirements of a project and the expectations of how the facility will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria and supporting information.

P.

1. Packaged Dry Products: Materials and products installed in dry form and delivered in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
2. Patching: Fitting and repair Work required to restore surfaces to original conditions after installation of other Work.
3. Pencil Copy: A preliminary review copy of the application for payment for review by Architect and Owner prior to submission of final copy.
4. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.
5. Permeable Surface: Surfaces which allow storm water to pass through and infiltrate the soil below.
6. Plastic Composites, or Wood-Plastic Composites: Composite materials made primarily from wood- or cellulose-based materials and plastics.
7. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
8. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
9. Product: Item obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", "assembly", and terms of similar intent.
    a. Comparable Product: A product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
    b. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature current as of date of the Contract Documents.
    c. Specified Products: Same as Named Products.
    d. New Products: Items that have not previously been incorporated into another project or facility, except products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

10. Project Documents: Consists of the Contract Documents, Approved Submittals, Requests for Information (RFI), Vendor documentation, Operations and Maintenance (O&M) information and other documentation that determines the requirements for acceptable installation and operation of the specific equipment and systems on the project.
11. Project Site: Space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
12. Protection Areas: As determined by Owner's Representative and as shown on drawings as Protection areas. Includes hospital areas adjacent to Containment Area, either occupied or used for passage, as well as areas connected to construction area by mechanical system air intake, exhaust and ductwork.
13. Provide: Furnish and install, complete and ready for the intended use.

Q.

1. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
2. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

R.

1. Rapidly Renewable Materials: Materials and products made from plants that are typically harvested within a 10-year or shorter cycle.
2. Recovery Schedule: Submittal of a revised critical path method (CPM) schedule and a written plan.
3. Recyclable: 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.
4. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
5. Recycled Content: Defined in accordance with the International Organization of Standards document ISO 14021, Environmental labels and declarations, Self-declared environmental claims (Type II environmental labeling). The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre- consumer), or after consumer use (post-consumer).
    a. Preconsumer material is defined as material diverted from the waste stream during the manufacturing process.
        1) Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.
        2) Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it; Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
    b. Postconsumer material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
6. Recycling: 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.

7. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
8. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
    a. Green Globes requirement for Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of [500] miles ([804.67] kilometers) from the Project site.
    b. Green Globes requirements for Regionally Manufactured Materials: Materials that are manufactured within a radius of [500] miles ([804.67] kilometers) from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.
9. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
10. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.
11. Remove: Detach items from existing construction and dispose off-site unless indicated as salvaged or reinstallation.
12. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage and turn over to owner.
13. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
14. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
15. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
16. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
17. Request for interpretation (RFI): A request seeking one of the following:
    a. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
    b. A resolution to an issue which has arisen due to field conditions and affects design intent.
18. Resource Loading: The allocation of manpower and equipment necessary for completion of an activity as scheduled.
19. Retain: To keep existing items that are not to be removed or dismantled.
20. Return: To give back reusable items or unused products to vendors for credit.
21. Reuse: To reuse a construction waste material in some manner on the project site.
22. Reviewed: When used to convey Architect's action on Contractor's submittals, applications, and requests, "reviewed" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

S.

1. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.
2. Salvage: Recovery of demolition or construction waste for subsequent sale or reuse.
3. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

4. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
5. Scheduling Specialist (SS): An internal or third party entity contracted to the Owner providing scheduling advice (if applicable).
6. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
7. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
8. Semi-Exposed Portions of Casework: Include those members such as divisions, interior faces of ends, case back, backs and bottoms.
9. Solar Reflectance Index (SRI): The measure of a constructed surface's ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation. SRI values range from zero (solid black surface) to 100 (solid white surface). SRI value of a material is calculated according to ASTM E1980 and based on the aged, tested values of solar reflectance and thermal emittance.
10. Source Separation: Separating waste materials from the time they become waste.
11. Specified Products: Products listed as to be supplied as specified.
12. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
13. Start-Up: The activities where equipment is initially energized, tested and operated. Start-up is completed prior to Operational Testing and Functional Performance Testing and is an integral item documented in the System Verification Checklist (SVC).
14. Strip: To remove existing finish down to base material unless otherwise indicated.
15. Submittals: Written and graphic information and physical samples that require Architect's responsive action or are for information and do not require the architect’s action.
16. Substitutions: Changes from the Contract Document requirements proposed by the CONTRACTOR after the award of the Contract. Changes include products, assemblies, materials, equipment, and methods of construction. Proposed substitutions by the CONTRACTOR are considered to be requests for substitutions. Substitutions will be considered by the OWNER as a special request.
    a. Substitutions for Cause: Proposed substitutions due to changed Project circumstances beyond Contractor's control, such as product unavailability, unavailability of required warranty terms, or regulatory changes.
    b. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements, but may offer advantage to Contractor or Owner.
    c. The following are not considered to be requests for substitutions:
        1) Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements for substitutions listed in Section "Substitution Procedures."
        2) Revisions to the Contract Documents requested by the OWNER.
        3) Specified options of products and construction methods included in Contract Documents.
        4) The CONTRACTOR'S determination of and compliance with governing regulations and orders issued by governing authorities.
17. Subsystem: A portion of a system with characteristics similar to a system.
18. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
19. System Verification Checklist (SVC): List of static inspections and material or component tests that verify proper installation of equipment (e.g., belt tension, oil levels, labels affixed, gages in place, sensors calibrated, etc.), start-up activities and documentation, as

well as operational testing results. The checklists are meant to document all activities for an individual piece of equipment from procurement on the project through operational testing are performed in accordance with the requirements in the project documents.

T.

1. Testing:
   a. Field Quality Control Testing: Tests and inspections performed on site for installation of the Work and for completed Work.
   b. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
   c. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
   d. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
2. Testing Agency/Testing Agencies: Independent entity(ies) engaged to perform specific inspections, tests, or both, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
3. Testing Laboratory: Refer to Testing Agency.
4. “Thorough” cleaning of surfaces: Cleaning of surfaces which become exposed to dust shall be accomplished by the use of either a HEPA filtered vacuum cleaner or a wet mop.
5. Toxic: Poisonous to humans either immediately or after a long period of exposure.
6. Training Plan: A detailed plan prepared by the Contractor and reviewed by the Owner and Commissioning Authority that outlines the training activities, instructors, time durations, and system requirements in accordance with the Contract Documents and Commissioning Plan.
7. Trending: Data collection of monitored points using the Building Automation System, Lighting Controls System, Power Status and Monitoring System or independent data acquisition instrumentation.

U.

1. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

V.

1. Vertical Illuminance: Illuminance levels calculated at a point on a vertical service or plane.
2. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).
3. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame.
4. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.
5. Volatile Organic Compound (VOC): A carbon compound that vaporizes at normal room temperatures.

W.

1. 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.
2. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, and special coatings.

3. Wind Driven Rain Resistant Louver: Louver that provides specified wind driven rain performance determined by testing according to AMCA 500-L.
4. Wood-Plastic Composites: Refer to Plastic Composites.
5. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.
6. WRB: Water Resistive Barrier.

X.

Y.

Z.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

This page intentionally left blank

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
   1. Section 01 10 00 - "Summary" for work restrictions and limitations on utility interruptions.
   2. Section 01 21 00 - "Allowances" for allowance for metered use of temporary utilities.

1.3 REFERENCE STANDARDS

A. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. The contractor shall, at its expense, make all arrangements necessary to secure the availability of and maintain all temporary utilities required to construct and operate the Contractor’s Work as required by the Contract Documents. This includes legal sketches and descriptions for easement as well as record drawings requirements required by utility companies.

C. Contractor shall be responsible for all costs or fees associated with temporary or permanent utilities, with the exception of the permanent utility connection fees, until Final Completion or Owner Acceptance/Occupancy, whichever comes first.

D. The contractor shall be responsible for providing and installing all provisions required by utility companies including but not limited to, transformer pads, service raceways, bollards, etc.

E. Sewer Service: If no existing service exists, Pay sewer-service use charges for sewer usage by all entities for construction operations.

F. Water Service: If no existing service exists, Pay water-service use charges for water used by all entities for construction operations.

G. Electric Power Service: If no existing service exists, Pay electric-power-service use charges for electricity used by all entities for construction operations.

H. Water and Sewer Service from Existing System: If existing services exist, Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

I. Electric Power Service from Existing System: If existing power service exists, Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.6 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 calendar days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
   1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
   2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
   3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust and HVAC Control Plan: Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   4. Waste-handling procedures.
   5. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
   1. Methods used to meet the goals and requirements of the Owner.
   2. Concrete cutting method(s) to be used.
   3. Location of construction devices on the site.
   4. Show compliance with the use and maintenance of quiet construction devices for the duration of the Project.
   5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
   6. Indicate locations of sensitive areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.7 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.8 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (182.88 cm) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

C. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches (914 by 1524 mm).

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. The Field Office shall include a conference room capable of holding meetings with a minimum of 10 people. Field office to include table & chairs. The contractor shall have the Field Office professionally cleaned a minimum of one time per month.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Cameras: Contractor shall, at its expense, provide a minimum of one (1) camera on the project site and a sign at or near the job site entrance stating, “Project Site Under Surveillance”. The camera shall be continuously recording, and Contractor shall provide to the owner remote access to a live feed for the camera. Recordings shall be kept for up to four weeks from the date taken. Contractor shall provide digital copies of recordings at request of Owner.

B. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

C. HVAC Equipment: Unless the Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction. and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."

D. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for the use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from

adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to the level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner. If there is no available power from Owner, then Contractor is responsible to obtain power service. Any costs for power are to be included in Contractor’s bid.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. If there is no available power from Owner, then Contractor is responsible to obtain power service. Any costs for power are to be included in Contractor’s bid.

1. Install electric power service overhead unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating the entire system.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.
    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Contractor's emergency after-hours telephone number.
    e. Architect's office.
    f. General Contractor's home office.
    g. Engineers' offices.
    h. Owner's office.
    i. Principal subcontractors' field and home offices.

J. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (914.4 cm) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 31 10 00 - "Site Clearing."
3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 32 12 00 - "Hot-Mix Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

F. Storage and Staging: Use designated areas of Project site for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs, so they are legible at all times.

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.

4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting the number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.

3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into a partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when the need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. The owner reserves the right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove

materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

This page intentionally left blank

SECTION 01 56 00 - TEMPORARY BARRIERS AND ENCLOSURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Temporary jobsite protection including the following:
   1. Temporary floor and wall protection.
   2. Door jamb protection.
   3. Small project floor and wall protection.
   4. Seaming tape for floor protection.
   5. Recyclable, portable jobsite trash containers.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - 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. Installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer: Minimum Five (5) years' experience manufacturing similar products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handle materials to avoid damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Specifications are based on products of manufacturers named as the Basis of Design. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions to be considered.
   1. Ram Board.
   2. Surface Shields.
   3. Trimaco, Inc.

2.2 TEMPORARY FLOOR AND WALL PROTECTION

A. Temporary protection board shall comply with the following requirements, as necessary for the use.
   1. Materials:
   2. Fold lines allowing corner, horizontal and vertical wall protection.
      a. Wall guard fold lines at 4 inches (101 mm), 8 inches (203 mm) and 12 inches (305 mm) from edge of board.
   3. Allow protected substrates and finishes to cure while being protected.
   4. Protection against water, paint, mud, and more.

B. Basis of Design:

1. Products as manufactured by Ram Board.
    a. Heavy Duty Temporary and Reusable Floor and Wall Protection: Ram Board Model #RB 38-100.
    b. Pre-Taped Board: Ram Board Plus Model #RB PLUS 38-100.
    c. Reusable Protection for Small Projects: Ram Board Home Edition Model #RBHE 36-50.
    d. Painter's Board: Ram Board Painter's Board Model #20RB 35-50.

2.3 DOOR JAMB PROTECTION

A. Door Jamb Protection: Heavy-duty flexible re-usable door jamb protection.
    1. Materials: Recycled and recyclable materials.
    2. Door Jamb Sizes: Fits 4 inches – 9 inches (102 mm – 229 mm).
    3. Basis of Design: Model # RBJP 60 or RBJP 36 Ram Jamb.

2.4 SEAMING AND EDGE TAPES FOR FLOOR PROTECTION

A. Seaming Tape: Used to cover Ram Board seams.
    1. Backing: Unique kraft backing tears easily and creates an extremely durable, smooth finish.
    2. Basis of Design: Ram Board Model #RT 3-164.

B. Vapor-Cure Tape: Used to cover Ram Board seams which prevents tape lines.
    1. Performance: Allows vapors and moisture to escape from concrete, glue down floors, stained floors, epoxy floors, refinished floors, vinyl composition tile, and most other floor types.
    2. Basis of Design: Ram Board Model #RB VCT 3-108

C. Edge Tape: Used to secure Ram Board Temporary Floor Protection edges to flooring or wall surfaces.
    1. Performance: Easy Release, low tack tape for up to 14 days. Grips tightly to Ram Board while easy release on flooring surfaces up to 14 days.
    2. Basis of Design: Ram Board Model #RB ET 2.5-180.

2.5 PORTABLE JOBSITE TRASH CONTAINERS

A. Portable Jobsite Trash Containers: Portable, reusable jobsite trash container.
    1. Fits Trash Bags: 42 gal – 50 gal (159 to 189 L).
    2. Quick self-locking assembly, no tape required.
    3. Basis of Design: Ram Board Trash Box Model # RBTB 16-36.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation. Proceed with installation or protection products only after unsatisfactory conditions have been corrected.

B. Do not begin protection installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install protection products in accordance with manufacture's written instructions and approved submittals.

3.3 PROTECTION

A. Protection installed products may be left in place until completion of project or adjacent work.

END OF SECTION

SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Protecting of existing trees (Refer also to the Drawings).

B. Protecting of existing utilities.

C. Protection fencing and planking

1.3 REFERENCE STANDARDS

A. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 GENERAL PROVISIONS

A. Trees and areas scheduled for work under this contract shall be identified in the field and indicated on plans and specifications where practical. Where this is not practical, work shall be directed in field by the Owner's Designated Representative (ODR).

B. Provision for access to the site for heavy equipment will be as directed by Owner’s Representative. Equipment shall use prescribed temporary roadways and shall not be allowed in areas other than designated construction areas and designated roadways. Open grass areas which are altered or disturbed by equipment during the work shall be returned to pre-existing conditions at no additional cost to the Owner.

C. The Contractor shall protect root areas and crowns of trees from damage from construction operations and construction equipment. The Contractor shall repair such damage at no costs to the Owner. Provide fences or other barricade where necessary for such protection.

D. The Contractor shall modify exhaust pipes on construction equipment as needed to ensure that tree crowns are not damaged from exhaust heat from vertical exhaust pipes on construction equipment.

E. Equipment shall not contact tree trunks, limbs or foliage.

F. The Contractor shall be responsible for providing all tree work/repair to any damage to existing trees during the contract period. Damage to any existing trees shall be reported immediately to the Owner’s Representative. The Contractor shall submit to the Owner’s Representative a written program of corrective pruning and tree care to repair damage with name of qualified forester or aborculturist for the Owner’s approval.

1.6 SUBMITTALS

A. Furnish required copies of manufacturers literature, samples, certifications, or laboratory Analytical data for the following items:
   1. Tree paint (manufacturer’s literature).

B. Urban forester or Arborist. (Resume with education, experience, and credentials)

C. Soil separator (manufacturer’s literature and sample). For vapor barrier 10 mil visquene.

D. Gravel (1 cubic foot).

E. Mulch: Decomposed hardwood mulch: submit 1 cubic foot sample.

F. Fertilizer: Submit product data.

PART 2 PRODUCTS

2.1 TRENCHING MACHINE

A. Shall be small, non-riding track type trencher equal to Case 300.

2.2 SHARP SAND

A. ASTM C33/C33M for fine aggregate.

2.3 TREE PROTECTION FENCE POSTS

A. 7 foot long metal T-Posts.

2.4 TREE PAINT

A. Thompson Tree Seal, Cabot Tree Paint or approved equal.

2.5 PRUNING TOOLS

A. Shall be of good quality and working condition, sharp and approved type for arboricultural work.

2.6 FENCING

A. Shall be orange plastic fencing 4 feet tall.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Work shall be performed by personnel trained and experienced in this work and shall be done under the direction of a qualified forester or arborist on the Contractor's staff. The Owner shall review and approve the Contractor’s program for repair to damaged trees prior to the work being done.

B. Work shall be performed in conformance with recognized horticultural and arboricultural practices. Where job requirements require deviation from normal practice, obtain approval.

3.2 LIMB PRUNING

A. Comply with ANSI A300 Part 1.

3.3 MAINTENANCE PRUNING

A. Maintenance pruning is to maintain or improve tree health and structure and shall consist of the following: limited to branches measuring 1 inch and larger.

B. Crown Cleaning: Crown cleaning shall consist of the removal of the following items: dead, dying, diseased, weak branches from a tree’s crown. Remove waterspouts from trucks and major limbs clearing up to a maximum distance of only 6 feet to 8 feet from main trunk.

C. Crown Thinning: Crown thinning shall consist of the selective removal of branches to increase light penetration, air movement, and reduce weight.

D. Crown Raising: Crown raising shall consist of the removal of the lower branches of a tree in order to provide clearance. Clearance to be determined by the Owner's Designated Representative (ODR).

E. All trees designated to remain and to be protected shall be pruned per ANSI A300 Part 1 1995 standards.

F. All cuts shall be made as close as possible to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub. Bark at the edge of all pruning cuts should remain firmly attached.

G. All branches too large to support with one hand shall be precut to avoid splitting or tearing of the bark. Where necessary, ropes or other equipment should be used to lower large branches or stubs into the ground.

H. Trimming shall not alter the natural appearance or result in leaving a hole in the canopy.
   1. Paint wounds on Oak trees with approved paint.
   2. Old injuries are to be inspected. Those not closing properly and where the callus growth is not already completely established should be bark traced if the bark appears loose or damaged. Such tracing shall not penetrate xylem (sapwood), and margins shall be kept rounded.
   3. Equipment that will damage the bark and cambium layer should not be used on or in the tree. For example, the use of climbing spurs (hooks, irons) is not an acceptable work practice for pruning operations on live trees. Sharp tools shall be used so that clean cuts will be made at all times.
   4. All cut limbs shall be removed from the crown upon completion of the pruning.
   5. Trees susceptible to serious infectious diseases should not be pruned at the time of year during which the pathogens causing the diseases, or the insect vectors are most active. Similarly, if pruning wounds may attract harmful insects, pruning should be timed so as to avoid insect infestation.
   6. Remove the weaker or less desirable of crossed or rubbing branches. Such removal, if possible, should not leave large open spaces in the general outline of the tree.
   7. Where practical, all visible girdling roots shall be treated by the following methods:
      a. Cut root at either end.
      b. Sever root in center with a chisel and allow growing tree to push root away.
      c. Remove section of root.
   8. The presence of any disease condition, fungus fruit bodies, decayed trunk or branches, split crotches or branches, cracks, or other structural weaknesses shall be reported in writing to a supervisor and/or the Owner and corrective measures recommended.

3.4 ROOT PRUNING (IN AREAS WHERE ROOTS CANNOT BE PRESERVED BY HAND DIGGING)

A. Root pruning shall be installed at the back of new curb for the parking lot excavation where the excavation for the lot lowers the grade below the existing grade within the drip line of the existing trees and in areas where soils will be lime stabilized.

B. Root prune at edge of proposed excavation or lime stabilization only in areas where roots cannot be preserved.

C. Root pruning by trenching shall be as required; 24 inches deep and 6 inches wide, or 10 inches below limits of proposed excavation, lime stabilization or soil disturbance, whichever is less.

D. Trenching shall be performed by the approved trencher cutting any and all roots completely and cleanly. Tearing, shredding or pulling of the roots shall not be permitted. After trenching with machine, re-cut roots with pruning shears or saw to leave a smooth cut surface.

E. Install 10 mil visquene in root prune trench to create non-leach barrier between soil stabilizer material and root zone.

F. Fill trench to existing finished grade in a manner that will not allow soils to settle.

G. Cover exposed roots within 24 hours using bank sand topsoil or mulch to prevent desiccation.

3.5 FENCES AND BARRICADES

A. Fences and/or barricades shall be installed prior to the commencement of any site preparation work (cleaning, grubbing or grading) placed where shown on the drawings or as herein described. Tree fencing shall be maintained throughout the construction project in order to prevent the following:
   1. Soil compaction in the root zone area resulting from vehicular traffic or storage of equipment and/or equipment and/or materials.

2. Root zone disturbances due to grade changes (greater than 3 inches cut or fill), and /or trenching not reviewed or authorized by the Owner's Designated Representative (ODR).
3. Wounds to exposed roots, trunks, or limbs by mechanical equipment.
4. Other activities detrimental to tress such as: chemical storage, cement truck wash-out and fires.

B. In general, fences and barricades are intended to alert those working on the project that equipment and machinery are not to be stored or operated in the root zone. Where not shown, the fences shall be placed at the drip line. The exact location of fences shall be marked on site by the Contractor and approved by the Owner's Designated Representative (ODR) prior to construction of barricades.

C. Posts shall be installed 8 feet O.C. maximum, 1-1/2 feet deep. Fence material pulled taut and secured with galvanized wire.

3.6 TREE PROTECTION

A. All trees to be preserved on the property shall be protected against damage during construction operations by fencing as shown; subject to the approval of the Owner's Designated Representative (ODR). The tree protection shall be installed prior to commencement of any site preparation work (clearing, grubbing or grading) and maintained in repair for the duration of the construction work unless otherwise directed. No material shall be stored or construction operation shall be carried on within a distance as shown of any tree to be saved or within the tree protection fencing. Tree protection shall remain until all work is completed.
1. Place 6 inches of mulch to completely cover the area underneath the drip line of the trees in areas where foot traffic cannot be avoided.
2. Trees shall be watered once a week during periods of hot dry weather or as directed by the Owner's Designated Representative (ODR) representative to thoroughly saturate soil.
3. All grading within protected root zone areas shall be by hand or small equipment to prevent root damage resulting from soil compaction and rutting. Prior to grading relocate protective fencing to two feet behind grade change area.

B. Any damage done to existing tree crowns or root systems shall be repaired immediately by an approved tree surgeon at the Owner's direction. Roots exposed and/or damaged during demolition and/or grading operations shall be cut off cleanly inside the exposed or damaged area, the cut surfaces painted with an approved tree paint, and the topsoil and mulch placed over the exposed root area immediately. The Owner shall have their representative present on the site to observe these operations.

3.7 CONSTRUCTION EQUIPMENT

A. The Contractor shall modify construction equipment as necessary to ensure that exhaust systems do not burn or scorch tree crowns or branches. Vertical exhaust pipes shall be turned 90 degrees.

B. Height of equipment and equipment operation heights shall be carefully monitored to ensure no damage to tree crowns or branching.

3.8 BORER PROTECTION

A. Immediately after tree protection is complete, apply specified insecticide at the rate prescribed by the manufacturer's instructions.

3.9 ADDITIONAL PROVISIONS

A. No trash or warming fires shall be placed within 25 feet of the tree canopy.

B. No pedestrian traffic shall occur within the drip line of any tree without proper protection measures in place.

C. No soil shall be spread, under any tree within the drip line, unless otherwise designated or approved by the Owner's Designated Representative (ODR).

D. Hand dig to preserve roots measuring 1 inch in diameter and larger, roots shall not be scuffed or damaged otherwise.

END OF SECTION

This page intentionally left blank

DIVISION 01 57 00 - SOIL EROSION CONTROL

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section,

1.2 DESCRIPTION OF WORK

A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

B. Erosion and sediment control measures shall be installed prior to any construction activity.
Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity.

C. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

A. Contractor is to achieve the following goals:
1. Minimize soil exposure by proper timing of grading and construction.
2. Retain existing vegetation whenever feasible.
3. Vegetate and mulch denuded areas as soon as possible.
4. Divert runoff away from denuded areas.
5. Minimize length and steepness of slopes when it is practical.
6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
7. Trap sediment on site.
8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5 years.

B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal. The cost of soil erosion control shall include all equipment, labor and materials necessary to comply with the State of South Carolina Erosion and Sediment Control Program.

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

A. Refer to Section 02902 — Grassing.

1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.
2. Type of Seed. Either Annual Rye or Common Bermuda Grass seed will be used depending on time of year in which seeding is to occur.
3. Mulch Straw.
4. Fertilizer: Commercial balanced 4-12-12 fertilizer.

2.2 SILT FENCE

A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

<u>Woven Fabrics</u>
Grab Strength:…….. 90 lbs
Burst Strength: ……..……175 psi
UV Resistance: ……..80%

2.3 CHEMICALS FOR DUST CONTROL

A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.4 RIP-RAP

A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25 pounds to a maximum of 125 pounds. At least 50 percent of the stone shall weigh more than 60 pounds. The stone shall have a minimum dimension of 12 inches.

2.5 PRODUCT REVIEW

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3- EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those bailfield areas to be sodded or to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14 days of work ending unless work is to begin again before 21 days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

A. Refer to Section 02400 – Lawn Restoration.

3.3 SEDIMENT BARRIERS

A. Rock Ditch Check
   1. Excavate a 6 inch deep trench the width and length of proposed barrier, Install a non-woven geotextile fabric in the trench before placing rock for the ditch check.
   2. The body of the ditch check shall be constructed of 12 inch rip-rap. The upstream face may be covered with 1-inch washed stone.
   3. Ditch checks shall not exceed a height of 2 feet at centerline of the channel and have a minimum top flow length of 2 feet.
   4. Rip-rap shall be placed over the channel banks to prevent water from flowing around ditch check. Rock must be installed by hand or

mechanical placement (no dumping of rock) to achieve complete coverage of the ditch and ensure the center of the check is lower than the edges.

5. The maximum spacing between ditch checks shall be where the toe of the upstream check is at the same elevation as the top of the downstream check.

6. Contractor shall maintain ditch checks as required by State regulations.

3.4 SILT FENCE

A. Silt fence shall be placed at approximate location shown and installed in accordance with
the detail on the construction drawings. Contractor shall maintain silt fence as required by
state regulations.

3.5 DUST CONTROL

A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer’s recommendations.

B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

A. A sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity.

3.7 RIP-RAP

A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

A. Construct exit at the location shown per detail on the construction drawings. Contractor

shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

A. Install inlet protection per detail on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

END OF SECTION

This page intentionally left blank

SECTION 01 60 00.0 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; comparable products and substitutiions.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Products.
      a. Named Products.
      b. New Products.
      c. Comparable Product.
   2. Basis-of-Design Product Specification.

B. Substitutions.
   1. Substitutions for Cause.
   2. Substitutions for Convenience.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form:
      a. Use facsimile of form provided in Project Manual.
      b. Use CSI form 13.1 A
   2. Include complete information as required in the Substitution Form. Incomplete information will result in automatic rejection of the substitution request.
   3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and Contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
i. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
j. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
k. Cost information, including a proposal of change for a credit to the owner, if any, in the Contract Sum.
l. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
m. Submittals not requested will not be recognized or processed.

4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
   a. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.6 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.7 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. 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.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.9 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
   b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
   a. PART 7 Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
   b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in paragraph "Substitutions" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 SUBSTITUTIONS

A. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   1. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   2. Substitution request is fully documented and properly submitted.
      a. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
         1) Statement indicating why specified product or fabrication or installation cannot beprovided, if applicable.

2) Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and Contractors, that will be necessary to accommodate proposed substitution.
3) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
4) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
5) Samples, where applicable or requested.
6) Certificates and qualification data, where applicable or requested.
7) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
8) Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
9) Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
10) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
11) Cost information, including a proposal of change for a credit to the owner, if any, in the Contract Sum.
12) Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
13) Submittals not requested will not be recognized or processed.

3. Requested substitution will not adversely affect Contractor's construction schedule.
4. Requested substitution has received necessary approvals of authorities having jurisdiction.
5. Requested substitution is compatible with other portions of the Work.
6. Requested substitution has been coordinated with other portions of the Work.
7. Requested substitution provides specified warranty.
8. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Substitutions for Convenience: Not allowed unless otherwise indicated.

D. Substitutions for Convenience: Architect will consider requests for substitution if received ten (10) days prior to Bid and within thirty (30) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
k. Additional requirements as indicated on the Substitution Request Form.

PART 3 EXECUTION

3.1 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. 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.
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.

C. 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.

END OF SECTION

SECTION 01 60 00.1 - REQUEST FOR SUBSTITUTION FORM

PROJECT INFORMATION

PROJECT NAME AND NUMBER: _____

CONTRACT AWARD DATE:

_____

TO: _____

SUBSTITUTION REQUESTED BY: _____

REQUEST MADE DURING:

_____ Bidding

_____ Construction Period

CAUSE FOR REQUEST: _____

SUBSTITUTION INFORMATION

SUBMIT IN ACCORDANCE WITH SECTION 01 33 00 - SUBMITTAL PROCEDURES.

1. Technical data, cost, and time information relating to changes to Construction Documents required by proposed substitution.

2. Detailed comparison of proposed substitution and specified product including but not limited to warranty, significant variations, qualifications of manufacturers, and maintenance.

3. Complete technical data, detailed shop drawings, samples, installation procedures, warranty, and substantiating data marked to indicate equivalent quality and performance to that specified. Manufacturer sell sheets are not acceptable submittals.

BASIS OF DESIGN

Specified Manufacturer: _____

Specified Product: _____

Where Specified:

Drawing (Sheet Number and Detail/Schedule): _____

Specification: (Section Number and Paragraph): _____

PROPOSED SUBSTITUTION

We submit for consideration the following manufacturer / product in lieu of the specified item for the above referenced project:

Proposed Manufacturer: _____

Proposed Product: _____

COST AND TIME

Does proposed substitution affect adjacent work, Construction Documents, Cost, Schedule, Quality, or related submittals?

_____ No

_____ Yes

Contractor is responsible for costs and additional time associated with proposed substitution including costs incurred by Architect for evaluation of substitution and changes to the documents. Describe costs for changes to design, including engineering and detailing costs caused by requested substitution.

_____

_____

Cost Savings Realized by Owner ($ US): _____

WARRANTY

Is warranty for proposed substitution the same as for specified product?

_____ Yes
_____ No
If No, Explain Differences: _____
_____

CONTRACTOR CERTIFICATION:

In making this request for substitution, Contractor certifies that:

1. Proposed substitution has been thoroughly researched and evaluated and determined as equivalent or superior to specified product or material, will fit into space provided, and is compatible with adjacent materials.
2. Proposed substitution will provide the same or better warranty at no additional cost to the Owner.
3. Cost data is complete and includes related costs under the Contract. Claims for additional costs related to the proposed substitution that may subsequently become apparent are waived.
4. Contractor will assume responsibility for delays and costs caused by acceptance proposed substitution, if approved, are accepted by the General Contractor unless delays and costs are specifically mentioned and approved in writing by Owner and Architect.
5. Contractor will assume liability for performance of the substitution.
6. Installation of the proposed substitution is coordinated with the Work and with changes required to the Work.
7. Contractor will reimburse Owner and Architect for evaluation and redesign services associated with the substitution request and, when required, for approval by authorities having jurisdiction.

PREVIOUS USE

Has the proposed substitute manufacturer / product been installed on previous Craig Gaulden Davis / PBK projects within the past two years?

_____ No
_____ Yes
If Yes, list project(s):
Project: _____
Owner:_____
Contact: _____
Project: _____
Owner: _____
Contact: _____

SUBMITTED BY:

Contractor's Signature: _____
Signature shall be by the individual authorized to legally bind the Contractor to the above terms. Failure to provide legally binding signature will result in retraction of acceptance.

Firm: _____

Telephone: _____ Date: _____

SUBSTITUTION EVALUATION

FOR USE BY ARCHITECT:

___ Accepted ___ Accepted as Noted ___ Not Accepted ___ Received too Late

By: _____ Date: _____

Remarks: _____

_____

FOR USE BY OWNER:

____ Accepted _____ Not Accepted

By: _____ Date: _____

Remarks: _____

_____

END OF SECTION

This page intentionally left blank

SECTION 01 73 00 - EXECUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Cutting.
   2. Patching.

1.4 SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor legally qualified to practice in the State of South Carolina, who is experienced in providing land surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not warranted. Before beginning site Work, investigate and verify

existence and location of underground utilities, mechanical and electrical systems, and construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; underground electrical services, and other utilities.
2. Furnish location data for Work related to the Work that must be performed by public utilities serving the site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation after correcting unsatisfactory conditions. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with Authorities Having Jurisdiction (AHJ).

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 - Project Management and Coordination.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, promptly notify Architect.

B. Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as necessary to locate each element of Project.
2. Establish limits on use of site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by Authorities Having Jurisdiction (AHJ).

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical Work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control Work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with Authorities Having Jurisdiction (AHJ) as the official "property survey."

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical Work plumb and make horizontal Work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions ensuring the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous. Materials containing asbestos and BCPs are prohibited.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with Work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's Work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. Clean site and Work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 degrees F (27 degrees C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 - Temporary Facilities and Controls.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with mechanical, plumbing, and electrical.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with Section 01 40 00 - Quality Requirements.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion. Refer to Section 01 56 00 - Temporary Barriers and Enclosures.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

DIVISION 01 74 00 - MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes operations which cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent of work involved. Furnish all labor, materials, equipment and incidentals to complete the work under this Section.

B. The work of this Section includes, but is not limited to, the following:
   1. Restoring of sidewalks, driveways, curbing and gutters.
   2. Crossing utilities.
   3. Relocation of existing water lines, low pressure, gas lines, telephone lines, electric lines, cable TV lines and storm drains as necessary, all as shown on the drawings.
   4. Restoring easements and rights-of-ways.
   5. Cleaning up.
   6. Incidental work.

1.2 WORK SPECIFIED UNDER OTHER SECTIONS

A. All work shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of these Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials required for this Section shall be of at least the same type and quality as materials that are to be restored. Where possible, reuse existing materials that are removed and then replaced, with the exception of paving.

PART 3 EXECUTION

3.1 RESTORING OF CURBING, FENCES, AND GUARD RAILS

A. Existing curbing shall be protected. If necessary, curbing shall be removed from joint to joint and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curing of equal quality and dimension.

3.2 CROSSING UTILITIES

A. This item shall include any extra work required in crossing culverts, water courses, drains, water mains, and other utilities, including all sheeting and

bracing, extra excavation and backfill, or any other work required for the crossing, whether or not shown on the drawings.

3.3 RELOCATIONS OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES, AND CABLE TV LINES

A. Notify the proper authority of the utility involved when relocation of these lines is required. Coordinate all work by the utility so that the progress of construction will not be hampered.

3.4 PROTECTION AND RESTORATION OF PROPERTY

A. Protection and Restoration of Property: During the course of construction, take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for the replacement or repair thereof. Immediately repair any damage to private property created by encroachment thereon. Should the removal or trimming of valuable trees, shrubs, or grass be required to facilitate the installation within the designated construction area, this work shall be done in cooperation with the County and/or local communities which the work takes place. Said valuable vegetation, removed or damaged, shall be replanted, if possible, or replaced by items of equal quality, and maintained until growth is re-established. Topsoil damaged in the course of work shall be replaced in kind with suitable material, graded to match existing grade. Following construction completion, the work area along the route of the installation shall be finish grade to elevations compatible with the adjacent surface, with grassing or hand raking required within developed areas.

B. Existing lawn surfaces damaged by construction shall be re-graded and re-sodded or re-seeded. These areas shall be maintained until all work under this Contract has been completed and accepted.

3.5 CLEANING UP

A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall render the site of the work in a neat and orderly condition.

B. Work site clean-up shall follow construction operations without delay and in accordance with Section 01 710.

3.6 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary for the proper completion of the Contract as specified and as shown on the drawings.

END OF SECTION

This page intentionally left blank

SECTION 01 74 13 - GENERAL CLEANING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Progress cleaning.
   2. Final cleaning.

1.3 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. Execute daily cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish. Contractor must utilize services of local waste collection agencies or companies.

C. Remove waste materials, debris and rubbish from the site periodically, and dispose of at legal disposal areas away from the site. Pay all fees for disposal.

3.2 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in specification section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.3 DUST CONTROL

A. Perform work operations and cleaning in a manner to prevent excessive dust generation.

B. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

C. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.4 FINAL CLEANING

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition. Polish glossy surfaces to a clear shine.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment [, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
    2) Clean permanent filters and replace disposable filters if units were operated during construction.
    3) Clean surfaces and blades of grilles, diffusers, registers, lenses, louvers, etc.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Enclosed spaces, such as above ceilings and voids in wall assemblies, are to be free from debris.
q. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds. Clean roof area and adjacent surfaces of any dirt or debris from construction activities.
r. Parking areas are to be cleaned of any grease or oil stains.
s. Leave Project clean and ready for occupancy.

B. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean. Inspect areas adjacent to the work area for any windblown debris and clean as necessary.

END OF SECTION

This page intentionally left blank

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for the following:
   1. Disposing of non-hazardous waste.

1.3 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.4 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Construction Waste.
   2. Demolition Waste.
   3. Disposal.
   4. Recycle.
   5. Salvage.
   6. Salvage and Reuse.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Firm having minimum 10 years documented experience in specializing in waste management coordination.

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

1.6 PERFORMANCE REQUIREMENTS

A. Conform to applicable regulations regarding Solid Waste Control.

B. Practice efficient waste management in the use of materials in the course of the Work.

1.7 WASTE MANAGEMENT PLAN

A. Develop a waste management plan and requirements.
   1. Submit plan within 20 days of date established for Notice to Proceed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

A. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract:
   1. Comply with operation, termination, and removal requirements in Section 01 50 00 - Temporary Facilities and Controls.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Site Access and Temporary Controls:

1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
    a. Comply with Section 01 50 00 - Temporary Facilities and Controls for the control of dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction:
    1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

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

END OF SECTION

SECTION 01 75 00 - STARTING AND ADJUSTING SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Starting systems.
   2. Demonstration and instructions.
   3. Testing, adjusting, and balancing.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner seven days prior to startup of each item.

C. Verify each piece of equipment or system for proper lubrication, drive rotation, belt tension, control sequence, or other conditions that may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of responsible Contractor's personnel in accordance with manufacturers' instructions.

G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to startup, and to supervise placing equipment or system in operation.

H. Submit a written report, verifying the proper installation of the equipment or system and that it functions correctly.

1.4 TESTING, ADJUSTING, AND BALANCING

A. Owner will appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balancing.

B. The independent firm shall perform the services as specified.

C. The independent firm shall submit reports to the Architect indicating observations, results of tests and compliance or non-compliance with specified requirements and with the requirements of the contract documents.

D. The independent firm shall coordinate scheduling of Testing, Adjusting, and Balancing activities with the Contractor.
   1. Testing, Adjusting and Balancing must be completed prior to scheduling equipment and system Functional Performance Testing.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 COORDINATION

A. Contractor shall coordinate equipment and system start-up with the Architect.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Project Closeout Meeting.
   2. Substantial Completion Procedures.
   3. Punchlists.
   4. Operation and Maintenance Manuals and Warranties.
   5. Project Closeout.
   6. Closeout Documents.
   7. Final Cleaning.
   8. Repair of the Work.
   9. Protecting Installed Construction.
   10. Extra Stock, Materials and Maintenance Products.
   11. Warranties, Certificates and Bonds.
   12. Final Completion.
   13. Final Payment.

1.3 PRE-CLOSEOUT MEETING

A. Pre-Closeout Meeting: Schedule and convene Pre-Closeout Meeting with Owner and Architect in accordance with Section 01 31 00 - Project Management and Coordination.

1.4 SUBSTANTIAL COMPLETION

A. Items listed in Supplementary Conditions, Article 9, Section 9.8 "Substantial Completion" and the following items shall be completed before Substantial Completion will be granted:
   1. Contractor’s Completion List (Punch List): Submit a thorough list of items to be completed or corrected, along with a written request for Substantial Completion and for review of the Work or portion of the Work. The Architect’s Project Representative, at their discretion, may attend and assist in the preparation of the Contractor's Punch List.
   2. Architect’s Supplemental Punch List: The Architect, along with the Owner at the Owner’s discretion, will inspect the Work utilizing the Contractor's prepared Punch List, noting completed items and incomplete items, and will prepare a supplemental list of items that have been omitted or incomplete items that were not previously noted.
   3. Operations and Maintenance Manuals: Submit as described in "Operations and Maintenance Manuals" article below.
   4. Final Cleaning: Provide final cleaning and adequate protection of installed construction as described in "Final Cleaning" and "Protecting Installed Construction" articles below.
   5. Starting of Systems: Start up equipment and systems as described in "Starting of Systems" article below.
   6. Testing and Balancing: Testing and balancing of systems must be performed and completed by Owner’s forces, and the report submitted and accepted by Architect and Owner, as described in the Contract Documents. Make adjustments to equipment as required to achieve acceptance.
   7. Demonstrations: If required by individual specification sections or by Owner, provide demonstrations and instructions for use of equipment as described in "Demonstration and Instructions" article below.

B. Date of Substantial Completion: Complete or correct items identified on Punch List and confirm that all items have been corrected prior to Architects re-inspection. Architect, along with the Owner, will re-inspect the corrected work to establish the Date of Substantial Completion. Incomplete items remaining will be appended to the Certificate of Substantial Completion (AIA G704). The Date of Substantial Completion represents day one (1) of the closeout period, and represents the date of commencement of the Contractors correctional period and all warranty periods as described and required by the Contract Documents, except as amended in the Certificate of Substantial Completion and elsewhere in the Contract Documents.

C. Certificate of Substantial Completion: When the Work or designated portion thereof is substantially complete, Architect shall prepare the Certificate of Substantial Completion to be executed by the Owner and Contractor. Items on the appended Punch List shall be completed or corrected within the time limits established in the Certificate.

1.5 PUNCH LIST

A. A comprehensive list prepared by the Contractor prior to Substantial Completion, and attached thereto, to establish all items to be corrected, or limited items of work to be completed, if any. This list is intended to represent a limited number of items needing attention.

B. Punch lists shall be furnished to the Architect in Microsoft Excel and PDF formats. The punch list shall be in matrix form and shall include the following information for each punch list item:
   1. Room number or other suitable location identifier
   2. Description of the work
   3. Sub-contractor/trade sign-off that the work has been verified to be 100% complete and in accordance with the Contract Documents
   4. Sub-contractor/trade sign-off date
   5. Contractor sign-off that the work has been verified to be 100% complete and in accordance with the Contract Documents
   6. Contractor/trade sign-off date
   7. Architect consultant sign-off
   8. Architect consultant sign-off date
   9. If requested by Owner, provide two additional similar columns for their signoff.
   10. In the case of excessive repetition of the same item at various locations, the punch list may contain "general notes/items" that shall be applied to the entire project; and it shall be the responsibility of the Contractor to thoroughly examine the entire project and make corrective measures at all applicable locations.

C. Should the Architect determine that the Contractor's punch list lacks sufficient detail or requires extensive supplementation, the punch list will be returned to the Contractor for reinspection and revision. The date of Substantial Completion will be delayed until the punch list submitted is a reasonable representation of the work to be done.

D. A significantly large number of items to be completed or corrected will preclude Architect from issuing a Certificate of Substantial Completion. Owner and Architect will be the sole judge of what constitutes a significantly large number of items. It is anticipated that the detailed list of items of work to be completed or corrected at the Date of Substantial Completion will be no longer than five (5) typed pages.

E. Contractor's superintendent shall participate in the preparation of Contractor's punch list that is submitted to Architect and Owner for supplementation. Upon receipt, Architect and Consultants shall perform a spot review to determine the adequacy and completeness of Contractor's punch list.

F. Upon receipt of an acceptable Contractor's punch list, the Contractor's Superintendent shall accompany Architect, their Consultants and Owner (at their discretion) during their observation and the preparation of their supplements to the Contractor's punch list.
   1. Superintendent shall record or otherwise take note of all supplementary items.

2. Architect shall endeavor to furnish to Contractor typed, hand-written, or recorded supplements to the punch list in a prompt manner; however, any delay in Contractor's receiving said supplements from Architect will not be cause for a claim for additional cost or extension of time as Contractor's Superintendent shall have been in attendance during the observations of Architect and their Consultants and will have been expected to take their own notes.

1.6 OPERATIONS AND MAINTENANCE MANUAL

A. As a requirement for Substantial Completion, the final Operation and Maintenance Manual shall be submitted to, and reviewed and accepted by the Architect prior to issuance of the Certificate.

B. Prepare 3-ring D-slant binder cover and spline with printed title "OPERATIONS AND MAINTENANCE MANUAL", title of project, and subject matter of binder when multiple binders are required.

C. Submit one (1) copy of preliminary Operations and Maintenance Manuals to respective consultants (Civil, MEP, Structural, etc.) for review of conformance with contract requirements prior to submitting final to Architect. Allow time for proper review.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and Maintenance, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Equipment start-up instructions
      e. Operating instructions.
      f. Maintenance instructions for equipment and systems.
      g. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Product data.
      b. Air and water balance reports.
      c. Photocopies of warranties, certificates and bonds. Submit originals with Closeout Documents as specified below.

G. Submit one (1) final original and two (2) copies to Architect.

H. Contractor shall provide a DVD, in PDF Format, the following documents after approval by the Architect, Consultants, and Owner: Closeout manual, Material Safety Data Sheet (MSDS) binder, Operations and Maintenance (O&M) Manuals, specifications, and approved submittals. Documents shall be hyper-linked to the Table of Contents.

1.7 PROJECT CLOSEOUT

A. Final Payment will not be authorized by Architect until Architect finds the Work acceptable under the Contract Documents, subject to the completion and acceptance of the following requirements and other applicable contract requirements:

1. Close-out Documents: Provide bound closeout documents as described in "Closeout Documents" article below. Refer to Supplementary Conditions, Article 9, Section 9.10 "Final Completion and Final Payment" for additional information.
2. Record Documents: Submit as described in "Project Record Documents" article below.
3. Extra Materials: Provide extra stock, materials, and products as described in "extra Stock, Materials, and Maintenance Products" article below when required by individual specification sections.
4. Locks: Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
5. Temporary Facilities: Discontinue and remove temporary facilities from the site, along with mockups, construction aids, and similar elements.
6. Warranties, Certificates and Bonds: Execute and assemble transferable warranty documents, certificates, and bonds from subcontractors, suppliers, and manufacturers as described in "Warranties, Certificates, and Bonds" article below.
7. Final Examination and Acceptance by Architect: As described in "Final Examination" article below.

1.8 CLOSEOUT DOCUMENTS

A. Prepare 3-ring D-slant binder cover and spline with printed title "CLOSEOUT DOCUMENTS", title of project, and subject matter of binder when multiple binders are required. Submit one (1) original and two (2) copies.

B. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

C. The close-out documents shall be neatly organized and easily useable as determined by the Architect and Owner. Separate Close-out Documents binders from Operations and Maintenance Manuals. Documents identified as "affidavit" shall be notarized.

D. Contents: Prepare Table of Contents for each volume, with each item description identified, typed on white paper, in five (5) parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers. All Contractor's vendors/suppliers and subcontractors that provided materials or performed any work related to this project must be listed on this form.
   2. Part 2: Closeout Documents and Affidavits, include the following:
      a. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims;
      b. AIA G706A - Contractor's Affidavit of Release of Liens;
      c. AIA G707 - Consent of Surety to Final Payment;
   3. Part 3: Project documents and certificates, including the following:
      a. Copy of Certificate of Substantial Completion (AIA G704);
      b. Copy of All Permits;
      c. Copy of Final Utility Bill or letter of transfer;
      d. Copy of Certificate of Occupancy;
   4. Part 4: Warranties, Release of Liens, compile sequentially based on specification sections:
      a. General Contractor's Warranty: Submit on company letterhead as described below. This Warranty shall state all sections of Work performed by Contractor's own forces, and warranty period for each section of Work;
      b. Subcontractor's Release of Lien: Include contractor's, subcontractor's and direct material and equipment supplier's separate final releases. Submit on attached 01 77 01 - Closeout Form A - Subcontractor's Affidavit of Release of Lien.
      c. Hazardous Material Certificate: Affidavits from Contractor, Subcontractors, and General Contractor's vendors or suppliers stating that no hazardous materials/products have been used or installed in this project. Submit on attached 01 77 02 - Closeout Form B - Subcontractor Hazardous Material Certificate.

d. Subcontractor's Warranty: Provide notarized Warranty stating all sections of Work performed by subcontractor and warranty period. Submit on attached 01 77 03 - Closeout Form C - Subcontractor Warranty.
e. Special / Extended Warranties; List and provide, notarized warranties requested by Owner, or required by or incorporated in the Contract Documents.
f. Spreadsheet depicting all items and materials that carry a warranty longer than one (1) year. Include information consisting of material/ supplier/ installer/ specification section/ length of warranty and contact information.

5. Part 5: Receipts:
   a. Extra Stock: Provide original receipts for delivery of "Extra Stock" items as described below. Receipts must be signed by an authorized Owner's representative;
   b. Keys: Provide original receipts for delivery of "Keys". Receipts must be signed by an authorized Owner's representative.
   c. Sign in sheets: provide signatures of attendees from all demonstrations.

E. In addition to the three (3) required close-out binders listed above, provide Architect with one (1) separate binder for their records containing the following:
   1. Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers;
   2. All MSDS sheets for the project;
   3. All warranties from Contractor, subcontractors, direct suppliers, and manufacturers.

F. Failure to complete and close-out project after substantial completion may result in liquidated damages being assessed to Contractor. Refer to Conditions of the Contract for additional requirements and liquidated damages.

1.9 FINAL CLEANING

A. Execute final cleaning prior to final project inspection and acceptance.

B. Clean interior and exterior glass, and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces, mop hard floor surfaces.

C. Remove smudges, marks, stains, fingerprints, soil, dirt, spots, dust, lint, and other foreign materials from finished and exposed surfaces

D. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

E. Clean and replace filters of operating equipment as required by Contract Documents

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste and surplus materials, rubbish, and temporary construction facilities from site.

1.10 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

1.11 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection as specified in Section 01 56 00 - Temporary Barriers and Enclosures and where specified in individual specification sections until Work is accepted by Architect and Owner.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.12 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner 48 hours prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of Contractor's personnel, and installer in accordance with manufacturers' instructions.

G. When specified in individual specification sections or required by manufacturer, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. When specified in individual specification sections or required by Owner or Architect, submit a written report in accordance with Section 01 33 00 - Submittal Procedures, that equipment or system has been properly installed and is functioning correctly.

1.13 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel a minimum of 48 hours prior to date of Final Completion in accordance with Owner’s requirements.

B. Demonstrate Project equipment instructed by qualified manufacturer's representative who is knowledgeable about the Project and equipment.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six (6) months.

D. Utilize maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment.

F. Prepare and insert additional data in maintenance manuals when need for additional data becomes apparent during instruction.

G. Review and verify proper star-up and operation of equipment prior to scheduling demonstrations with Owner.

H. All demonstrations are to be documented by video and submitted to Owner in DVD format along with the close out documents. Contractor is responsible for all video and compilation onto DVD with linked menus.

1.14 PROJECT RECORD DOCUMENTS

A. Project Record Documents, as described in Section 01 78 39, shall be submitted at Project Closeout. Final Payment will not be authorized by the Architect until final review and acceptance by Architect is achieved in accordance with the Owner's requirements.

B. At Contractor's request, and with associated fee, Architect may provide electronic versions of the construction drawing and specification files for Contractor's use, subject to the terms and conditions of Architect's standard electronic document transfer agreement.

C. Submit reproducible to respective consultants (Civil, Structural, MEP, etc.) for review. Consultant will mark-up corrections and return to Contractor for final revisions. Make final revisions prior to submitting to Architect.

1.15 EXTRA STOCK, MATERIALS, AND MAINTENANCE PRODUCTS

A. Furnish extra stock, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site or to Owner’s Maintenance Department as directed by Owner; obtain signed receipt from Owner's Designated Representative (ODR) prior to final application for payment. Delivery of materials to, or obtaining receipt from anyone other than Owner's Designated Representative (ODR) may constitute breach of this requirement and may require delivery of additional materials at no cost to Owner if original materials are misplaced.

C. Include signed receipts for delivery of extra stock and materials, including keys, with Closeout Documents.

1.16 WARRANTIES, CERTIFICATES, AND BONDS

A. Definitions:
   1. Standard Product Warranties: preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to Owner.
   2. Special Warranties: Written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide coverage of specific defects, or both.

B. In accordance with the general warranty obligations under General Conditions, Article 3, Section 3.5 "Warranty" as amended by the Supplementary Conditions, Contractor's warranty shall be for a period of one (1) year following the date of Substantial Completion, hereinafter called the one-year warranty period. Contractor's one-year general warranty shall include all labor, material and delivery costs required to correct defective material and installation. This warranty shall not limit Owner’s rights with respect to latent defects, gross mistakes, or fraud.

C. Contractor’s one-year warranty shall run concurrently with the one (1) year period for correction of Work required under General Conditions, Article 12, Section 12.2 "Correction of Work".

D. No service charges or call out charges are allowed to investigate warranty claims.

E. In addition to Contractor's one-year warranty, Special Warranties as described in individual specifications sections, shall extend the warranty period for the period specified without limitation in respect to other obligations which Contractor has under the Contract Documents.

F. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of the warranty on the Work that incorporates the products, nor does it relieve the suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

G. Warranty Requirements:
   1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
   2. When Work covered by a warranty has failed and been corrected by replacement or reconstruction, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
   3. 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. Contractor is responsible for the cost of replacing defective Work regardless of whether Owner has benefited from use of the Work through a portion of its anticipated useful service life.
   4. Written warranties made to 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 Owner can enforce such other duties, obligations, rights, or remedies.
   5. Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or designated portion of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

H. Compile copies of each required warranty properly executed by Contractor and the subcontractor, supplier, or manufacturer. Verify documents are in proper form, contain full information, and are notarized. Co-execute warranties, certificates and bonds when required and include signed warrantees with Closeout Documents submitted to Architect.

1.17 FINAL COMPLETION AND FINAL PAYMENT

A. Final Notice and Examination:
   1. When all items on the Punch List have been corrected, final cleaning has been completed, and installed work has been protected, submit written notice to Architect that the Work is ready for final examination.
   2. Upon receipt of written notice that the Work is ready for final inspection and acceptance, Architect will make final examination.

B. Final Change Order: When the Project Closeout items described above are successfully completed and the Work is found acceptable to Architect and Owner, a Final Change Order will be executed. This Change Order will include any Allowance adjustments as required by the Contract Documents.

C. Final Application for Payment: When all of the above items are successfully complete, submit to the Architect a final Application for Payment and request for release of retainage.

D. Release of Retainage: Release of retainage will not be authorized by Architect until Contractor completes all requirements for close-out to the satisfaction of Owner and Architect as described herein.

1.18 FINAL EXAMINATION

A. Immediately prior to expiration of the one (1) year period for correction of the Work, the Contractor shall make an inspection of the work in the company of the Architect and Owner. Architect and the Owner shall be given not less than ten (10) days notice prior to the anticipated date of final examination.

B. Where any portion of the work has proven to be defective and requires replacement, repair or adjustment, Contractor shall immediately provide materials and labor necessary to remedy such defective work and shall execute such work without delay until completed to the satisfaction of Architect and Owner, even if the date of completion of the corrective work may extend beyond the expiration date of the correction period.

C. Contractor shall not be responsible for correction of work which has been damaged because of neglect or abuse by Owner nor the replacement of parts necessitated by normal wear in use.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

This page intentionally left blank

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

1.3 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Subsystem.
   2. System.

1.4 SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section:
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format:
   1. Submit operation and maintenance manuals in the following format:
      a. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents for manuals at least 30 days before commencing demonstration and training.
      b. Architect will comment on whether content of operations and maintenance submittals are acceptable.
      c. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
   1. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents for manuals at least 30 days before commencing demonstration and training.Architect will comment on whether content of operations and maintenance submittals are acceptable.Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

D. Final Manual Submittal:
   1. Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments:

a. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with 01 77 00 - Closeout Procedures for schedule for submitting operation and maintenance documentation. Where applicable use 01 91 13 - General Commissioning Requirements.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files:
1. Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required:
a. Electronic files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
b. File names and bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR MANUALS

A. Organization of Manuals:
1. Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
a. Title page.
b. Table of contents.
c. Manual contents.

B. Title Page:
1. Include the following information:
a. Subject matter included in manual.
b. Name and address of Project.
c. Name and address of Owner.
d. Date of submittal.
e. Name and contact information for Contractor.
f. Name and contact information for Architect.
g. Names and contact information for major consultants to Architect that designed the systems contained in the manuals.
h. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents:
1. List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual:
a. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the

Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory:
   1. Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
      a. List of systems and subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
      b. List of equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
      c. Tables of contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content:
   1. Organize manual into a separate section for each of the following:
      a. Type of emergency.
      b. Emergency instructions.
      c. Emergency procedures.

C. Type of Emergency:
   1. Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
      a. Flood.
      b. Gas leak.
      c. Water leak.
      d. Power failure.
      e. Water outage.
      f. System, subsystem, or equipment failure.
      g. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures:
   1. Include the following, as applicable:
      a. Instructions on stopping.
      b. Shutdown instructions for each type of emergency.
      c. Operating instructions for conditions outside normal operating limits.
      d. Required sequences for electric or electronic systems.
      e. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual:
   1. Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures:

a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content:
1. In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
a. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
b. Performance and design criteria if Contractor has delegated design responsibility.
c. Operating standards.
d. Operating procedures.
e. Operating logs.
f. Wiring diagrams.
g. Control diagrams.
h. Piped system diagrams.
i. Precautions against improper use.
j. License requirements including inspection and renewal dates.

C. Descriptions:
1. Include the following:
a. Product name and model number. Use designations for products indicated on Contract Documents.
b. Manufacturer's name.
c. Equipment identification with serial number of each component.
d. Equipment function.
e. Operating characteristics.
f. Limiting conditions.
g. Performance curves.
h. Engineering data and tests.
i. Complete nomenclature and number of replacement parts.

D. Operating Procedures:
1. Include the following, as applicable:
a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Instructions on stopping.
f. Normal shutdown instructions.
g. Seasonal and weekend operating instructions.
h. Required sequences for electric or electronic systems.
i. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation and diagram controls as installed.

F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals:
1. Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance

documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information:

a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project manual and Drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation:
1. Include the following information for each component part or piece of equipment:
a. Standard maintenance instructions and bulletins:
1) Include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one (1) item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable:
(a) Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
c. Identification and nomenclature of parts and components.
d. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures:
1. Include the following information and items that detail essential maintenance procedures:
a. Test and inspection instructions.
b. Troubleshooting guide.
c. Precautions against improper maintenance.
d. Disassembly; component removal, repair, and replacement; and reassembly instructions.
e. Aligning, adjusting, and checking instructions.
f. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules:
1. Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment:
a. Scheduled maintenance and service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
b. Maintenance and service record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds:
   1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds:
      a. Include procedures to follow and required notifications for warranty claims.

J. Drawings:
   1. Prepare Drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these Drawings with information contained in record Drawings to ensure correct illustration of completed installation:
      a. Do not use original Project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project manual and Drawing or schedule designation or identifier where applicable.

D. Product Information:
   1. Include the following, as applicable:
      a. Product name and model number.
      b. Manufacturer's name.
      c. Color, pattern, and texture.
      d. Material and chemical composition.
      e. Reordering information for specially manufactured products.

E. Maintenance Procedures:
   1. Include manufacturer's written recommendations and the following:
      a. Inspection procedures.
      b. Types of cleaning agents to be used and methods of cleaning.
      c. List of cleaning agents and methods of cleaning detrimental to product.
      d. Schedule for routine cleaning and maintenance.
      e. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds:
   1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds:
      a. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

This page intentionally left blank

SECTION 01 78 30 - WARRANTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to Architect for review and transmittal to Owner.

1.3 SUBMITTAL REQUIREMENTS

A. Number of original signed copies required: Three (3) each.

B. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item:
   1. Product or work item.
   2. Firm, with name of principal, address and telephone number.
   3. Scope.
   4. Date of beginning of warranty, bond or service and maintenance contract. In no case shall the date begin prior to acceptance by Architect of that portion of the work.
   5. Duration of warranty, bond or service maintenance contract.
   6. Provide information for Owner's personnel:
      a. Proper procedure in case of failure.
      b. Instances which might affect the validity of warranty or bond.
      c. Contractor, name of responsible principal, address and telephone number.
      d. Manufacturer: Contact person and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:
   1. Size: 8-1/2" x 11" punch sheets for standard 3-ring binder:
      a. Fold larger sheets to fit into binders.
   2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
      a. Title of Project.
      b. Location of Project.
      c. Name of Contractor.

C. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers, all of same color.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during progress of construction:
   1. Warranties shall start at the Date of Substantial Completion for each phase of work complete for the items related to that particular phase. The final warranties for the project will list the individual dates for the start date of each warranty per phase.
      a. Submit documents as indicated with Closeout Documents.

B. For items of work where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in respective Sections of Specifications.

B. Submit additional manufacturer's standard warranties where available at no additional cost, but not specifically indicated in respective Specification Sections.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for project record documents, including but not limited to:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

1.3 SUBMITTALS

A. At Substantial Completion, deliver Record Documents to Architect for review prior to sending to the Owner.

B. Accompany submittal with transmittal letter in duplicate, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each Record Document.
   5. Signature of General Contractor or his authorized representative.

C. Should Architect/Engineer determine the Record Documents are not complete, General Contractor shall rework Documents to properly record all contractual items. Record Documents shall then be resubmitted for additional review. The General Contractor is solely responsible for recording all data on the Project Record Documents.

1.4 CLOSEOUT SUBMITTALS

A. Record Drawings:
   1. Number of Copies: Submit one set of marked up record prints.
   2. Number of Copies: Submit copies of record Drawings:
      a. Initial Submittal:
         1) Submit PDF electronic files of scanned record prints and one of file prints.
         2) Submit record digital data files and one sets of plots.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and one set of prints.
         2) Submit record digital data files and three sets of record digital data file plots.
         3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and one annotated PDF electronic file of the Project Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and one annotated PDF electronic file and directory of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked up Product Data as a component of manual.

D. Miscellaneous Record Submittals: Refer to the individual Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report monthly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.5 PROJECT RECORD DOCUMENT PROCEDURES

A. Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference.
   1. Do not use As-Built Drawings and Specifications for Record Drawings and Specifications.

B. Recording Procedures: Update drawings and specifications on daily bases to record actual conditions. Record information concurrently with construction progress. Do not conceal Work until required information is accurately recorded.

C. Store Record Documents and samples apart from as built documents used for construction.
   1. Label and file Record Documents and samples in accordance with section number listings in Table of Contents. Label each document PROJECT RECORD in neat, large, printed letters.
   2. Maintain Record Documents in clean, dry and legible condition.
   3. Make Record Documents and samples available for inspection upon request of Architect.

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked up paper copies of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked up record prints. Show actual installation conditions where installation varies from that shown originally.
      a. Give attention to information on concealed elements difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross reference record prints to corresponding shop drawings or archive photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked up record prints.
4. Mark record sets with erasable, red colored pencil. Use colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked up record prints with Architect. When authorized, prepare full set of corrected digital data files of the Contract Drawings:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings and annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    a. Refer to Section 01 33 00 - Submittal Procedures for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation PROJECT RECORD DRAWING in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
    a. Project name.
    b. Designation PROJECT RECORD DRAWINGS.
    c. Name of Architect.
    d. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Indicate actual product installation where installation varies from that indicated in Specifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 RECORD SAMPLES

A. Record Samples: Determine with Architect and Owner which submitted Samples are to be maintained as Record Samples. Maintain and mark one set to indicate date of review and approval by Architect; note any deviations or variations between reviewed sample and installed product or material.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by the individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Include the following:
1. Reviewed shop drawings, product data, and samples.
2. Field test reports.
3. Inspection certificates and manufacturer's certificates.
4. Inspections by Authorities Having Jurisdiction (AHJ) (AHJ).
5. Documentation of foundation depths.
6. Special measurements or adjustments.
7. Tests and inspections.
8. Surveys.
9. Design mixes.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked up miscellaneous record submittals. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

This page intentionally left blank

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of videographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date of video recording.
   2. At completion of training, submit complete training manual(s) for Owner's use.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 - Quality Requirements, experienced in operation and maintenance procedures and training.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Operations manuals.
      c. Maintenance manuals.
      d. Project record documents.
      e. Identification systems.
      f. Warranties and bonds.
      g. Maintenance service agreements and similar continuing commitments.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on meaning of warnings, trouble indications, and error messages.
      b. Instructions on stopping.
      c. Shutdown instructions for each type of emergency.
      d. Operating instructions for conditions outside of normal operating limits.
      e. Sequences for electric or electronic systems.
      f. Special operating instructions and procedures.
   4. Operations: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.
      d. Regulation and control procedures.
      e. Control sequences.
      f. Safety procedures.
      g. Instructions on stopping.
      h. Normal shutdown instructions.
      i. Operating procedures for emergencies.
      j. Operating procedures for system, subsystem, or equipment failure.
      k. Seasonal and weekend operating instructions.
      l. Required sequences for electric or electronic systems.
      m. Special operating instructions and procedures.
   5. Adjustments: Include the following:
      a. Alignments.
      b. Checking adjustments.
      c. Noise and vibration adjustments.
      d. Economy and efficiency adjustments.
   6. Troubleshooting: Include the following:
      a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine and preventative maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 77 00 - Closeout Procedures.

B. Set up instructional equipment at instruction location.

C. Provide a list of attendees.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

C. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

This page intentionally left blank

DIVISION 02 05 00 SITEWORK – GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Site work includes the work shown and reasonably inferred from the drawings, technical specifications, and contract documents. Provide materials, labor, equipment and supervision required to perform the work complete.

B. The scope of site work includes, but is not limited to the following:

1. Construction staking and other construction engineering required to control the work.
2. Erosion and sedimentation control construction.
3. Temporary groundwater control.
4. Site preparation, including stripping and undercutting unsuitable subgrade soils, demolition, and removal from the project lands of materials not to be used for construction.
5. Site grading, including excavation, filling, compaction, and preparation of subgrades for paving. Site grading includes importing material, stockpiling and hauling from stockpiles, and other work necessary to construct embankments and excavations as shown and specified.
6. Installation of the site drainage system complete, including building roof drain laterals.

1.2 SAFETY

A. Safety & Protection: Initiate, maintain, and supervise safety precautions and programs in connection with the Work. Take necessary precautions for the safety of, and provide the necessary protection to prevent damage, injury or loss to employees on the job and other persons or organizations.

B. Safe trench construction is mandatory. Lay back slopes or shore as necessary.

C. Control traffic during operations on existing streets.

D. Erect and maintain barricades, fences, and other physical blockages sufficient to exclude the public from construction areas.

1.3 PROTECTION OF ADJACENT LANDS

A. Limit construction to areas indicated on the drawings and designated by the Owner. Protect areas beyond the construction which are subject to the effect or byproduct of the construction effort.

B. Make special effort to prevent soil erosion and sediment transport onto adjacent lands. Restore disturbance to areas outside the designated construction limits to a satisfactory condition, as determined by the Owner at no cost to the Owner.

C. Take precautionary measures to prevent damage to the adjoining public street system. Clean mud or debris deposited as a result of this construction.

D. Perform construction on the right-of-way or on other properties not in possession of the Owner in strict accordance with the terms of the permits or easements. Obtain copies of permit and easement conditions affecting the work.

1.4 CONSTRUCTION ENGINEERING

A. Provide construction staking, dimensional control, and related construction engineering for phases of the Work.

1.5 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor is responsible for compliance with the Contract Documents. Monitoring and testing by the Geotechnical Engineer does not infer acceptance of responsibility by the Geotechnical Engineer, the Architect, the Engineer, or the Owner. When monitoring and testing indicates that construction does not meet Specification requirements, rework to obtain compliance.

1.6 AS-BUILT PLANS

A. Maintain "Contractor's mark-up as-built" plans of construction. Certify the accuracy and completeness of these plans and deliver to the Owner.

B. Prepare as-built plans of construction to be dedicated to School District and deliver in a form that is acceptable to the receiving agency.

END OF SECTION

DIVISION 02 05 01 - MATERIALS AND EQUIPMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Products.
B. Transportation and handling.
C. Storage and protection.
D. Product options.
E. Substitutions.

1.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.1 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.2 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate-controlled enclosures.

B. For exterior storage of fabricated Products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matters.

F. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

1.3 PRODUCT OPTIONS

A. Products specified by reference standards or by description only: Any product meeting those standards or description.

B. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named.

1.4 SUBSTITUTIONS

A. Architect / Engineer will consider requests for substitutions only within 15 days after date of Owner/Contractor Agreement.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with contract documents.

D. A request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.

Waives claims for additional costs or time extension which may subsequently become apparent.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written requests, or when acceptance will require revision to the contract documents.

F. Substitution submittal procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
3. The Architect / Engineer will notify Contractor, in writing, of decision to accept or reject request.

END OF SECTION

This page intentionally left blank

DIVISION 02 40 00 DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: All work necessary for the removal and disposal of buildings, structures, foundations, piping, equipment and roadways, or any part thereof including masonry, steel, reinforced concrete, plain concrete, electrical facilities, and any other material or equipment shown or specified to be removed.

B. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the work so as not to interfere with the day-to-day operation of the existing facilities. Do not block doorways or passageways in existing facilities.

C. Additional Requirements: Provide dust control and make provisions for safety.

1.2 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 1.

B. Site Inspection: Visit the site and inspect all existing structures. Observe and record any defects which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Provide the OWNER with a copy of this inspection record and obtain the (ENGINEER's) (OWNER's) approval prior to commencing the demolition.

1.3 QUALITY ASSURANCE

A. Limits: Exercise care to break concrete well for removal in reasonably small masses. Where only parts of a structure are to be removed, cut the concrete along limiting lines with a suitable saw so that damage to the remaining structure is held to a minimum.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION OF EXISTING DRAWINGS

A. Drawings of existing structures and equipment will be available for inspection at the office of the OWNER.

3.2 PROTECTION

A. General Safety: Provide warning signs, protective barriers, and warning lights as necessary adjacent to the work as approved or required. Maintain these items during the demolition period.

B. Existing Services: Undertake no demolition work until all mechanical and electrical services affected by the work have been properly disconnected. Cap, reroute or reconnect interconnecting piping or electrical services that are to remain in service either permanently or temporarily in a manner that will not interfere with the operation of the remaining facilities.

C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, and eliminate the hazard before demolition is started.

3.3 DEMOLITION REQUIREMENTS

A. Explosives: The use of explosives will not be permitted.

B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.

C. Removal: Remove all debris from the structures during demolition and do not allow debris to accumulate in piles.

D. Access: Provide safe access to and egress from all working areas at all times with adequate protection from falling material.

E. Protection: Provide adequate scaffolding, shoring, bracing railings, toe boards and protective covering during demolition to protect personnel and equipment against injury or damage. Cover floor openings not used for material drops with material substantial enough to support any loads placed on it. Properly secure the covers to prevent accidental movement.

F. Lighting: Provide adequate lighting at all times during demolition.

G. Closed Areas: Close areas below demolition work to anyone while removal is in progress.

H. Material Drops: Do not drop any material to any point lying outside the exterior walls of the structure unless the area is effectively protected.

3.4 DISPOSAL OF MATERIALS

A. Final Removal: Remove all debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition unless otherwise indicated. Take title to all demolished materials and remove such items from the site.

B. OWNER's Property: In addition to any items which may be shown, the following items remain the property of the OWNER. Remove carefully, without damage, all items listed or shown, and stockpile as directed.

END OF SECTION

This page intentionally left blank

DIVISION 03 05 10 - CEMENT CONCRETE

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 exterior cement concrete pavement for the following:
   1. Curbs and gutters.

B. Related Sections include the following:

   1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
   2. Division 2 Section "Pavement Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.
   3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Joint fillers.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

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

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend the conference:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete producer.
d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. 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.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C / F.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/4 to 1 inch nominal.

D. Water: ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3000 psi

2. Select water-cementitious materials ratio from options in subparagraph below or revise to suit Project. Select first option for concrete exposed to deicers or subject to freezing and thawing while moist. Select second for concrete required to have low water permeability.
3. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50
4. Slump Limit: 4 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 2 Section "Earthwork."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints

into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a [1/4-inch] radius. Repeat the tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer or use bonding agent if approved by Engineer.

J. Screed pavement surfaces with a straightedge and strike off.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

3.7 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch , minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 73-cu. yd. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

DIVISION 03 30 00 - SIDEWALKS, DRIVEWAYS AND CURBS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Sidewalks, sidewalk ramps, driveways, curbs and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.2 REFERENCES

A. Reference Standards: Conform the work for this Section to the applicable portions of the following standard Specifications.

1. ASTM - American Society of Testing and Materials
2. AASHTO - American Association of State Highway and Transportation Officials
3. SCDOT - Standard Specifications for Road and Bridge Construction.
4. ADAAG - American with Disabilities Act Accessibility Guidelines
5. UFAS - Uniform Federal Accessibility Standards

1.3 SUBMITTALS

B. Reports: Written permission for the use of all local disposal sites Furnish copies to the ENGINEER.

C. Test Reports:

1. Thickness and Compressive Strength: Provide the ENGINEER with two (2) certified copies of the test results. Perform the tests by a laboratory approved by the ENGINEER.

1.4 JOB CONDITIONS

A. Environmental Requirements:

1. Temperature: Comply with the requirements for concrete installation due to outside ambient air temperatures as specified under Article 3.3.I of this Section.

B. Protection:

1. Protection Against Rain: Comply with the requirements for protecting new work against damage from Rain, as specified under Article 3.3.I of this Section.

2. Protection Against Cold Weather: Comply with the requirements for protecting new work against damage from cold weather, as specified under Article 3.3.I of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: Use 3000 psi concrete except as modified herein.

B. Ready-Mixed Concrete: Use ready-mixed concrete which conforms to ASTM C94,
Alternate 2.

C. Water: Use water for mixing and curing concrete reasonably clean and free from oil, salt, acid, alkali, chlorides, sugar, vegetable, or other substances injurious to the finished product. Waters from sources approved by the local Health Department as potable may be used without test. Test water requiring testing in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T-26.

D. Concrete Curing Compounds: Use a white membrane curing compound for curing concrete which conforms to AASHTO M148, Type 1 clear, or Type 2 while per FDOT Section 925.

E. Premolded Joint Filler: Use fiber joint filler which conforms to ASTM D1751. Use filler of the thickness, as specified herein, or as directed by the ENGINEER.

F. Steel Hook Bolts: Use hook bolts which conform to ASTM A706, or for Grade 60 of ASTM A615, A616, or A617. Use 5/8-inch diameter hook bolts self-tapping.

G. Joint Sealant: Use hot-poured type joint sealant which conforms to ASTM D1190.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Excavation and Forming: Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.

1. Correct all defects and deficiencies before proceeding with the work.

B. Existing Improvements: Investigate and verify location of existing improvements to which the new work is to be connected.

1. Making necessary adjustment in line and grade to align the new work with the existing improvements must be approved by the ENGINEER prior to any change.

3.2 PREPARATION

A. Forms: Use wood or metal forms, straight and free from warp, clean, and sufficient strength to resist springing during the process of depositing concrete against them.

1. Use full depth of the concrete forms.

3.3 INSTALLATION

A. Sidewalks, Sidewalk Ramps, Driveways and Driveway Approaches: Construct all sidewalks and sidewalk ramps four (4) inches thick except at driveways and alleys. Construct thickness of the sidewalks six (6) inches at driveways and alleys. Construct sidewalks five (5) feet wide unless otherwise noted on the Plans or directed by the ENGINEER, and slope 1/4-inch per foot towards the center of the road. Normally, sidewalks will be located within the right-of-way, parallel to the property lines, at a distance of 1-foot from the property line.

1. Construct alleys, driveways and approaches six (6) inches thick. Construct the width of the driveways and driveway approaches as shown on the Plans or as directed by the ENGINEER.

B. Removal of Existing Curb for Sidewalk Ramps and Driveway Approaches: Conform construction of sidewalk ramps within street intersections where curbed pavement existing to the current FDOT Roadway and Traffic Design Standards.

1. Saw cut, to full depth of pavement, and remove a minimum of an 18-inch-wide curb and gutter section where there is no proper curb drop for the sidewalk ramp or driveway approach. When mountable curbs are present,

remove a 24inch wide curb and gutter section for the construction of sidewalk ramps, as specified above.

2. Remove curb and gutter as determined by the ENGINEER in the field but remove curb and gutter at least as wide as the proposed sidewalk ramp plus 1foot on each side.

3. Replace the removed curb and gutter section with materials, equal to what was removed and seal joint with hot poured rubber asphalt.

C. Placement of Forms: Use wood forms, straight and free from warp, of nominal depth for sidewalk sections less than 25 feet in length.

1. Stake forms to line and grade in a manner that will prevent deflection and settlement.

2. When unit slab areas are to be poured, place slab division forms such that the slab division joints will be straight and continuous.

3. Set forms for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. Use a uniform grade, except as may be necessary to eliminate short grade changes.

4. Oil forms before placing concrete. Leave forms in place at least 12 hours after the concrete is placed. Place forms ahead of the pouring operations to maintain uninterrupted placement of concrete.

5. The use of slip form pavers can be allowed when approved by the ENGINEER in lieu of the construction system described above.

D. Joints: Construct transverse and longitudinal expansion and plane-of-weakness joints at the locations specified herein, or as indicated on the Plans or as directed by the ENGINEER.

1. Place the transverse expansion joints for the full width and depth of the new work. Use transverse expansion joints placed against an existing pavement a minimum of six (6) inches deep but no less than the thickness of the concrete being placed.

2. Conform longitudinal expansion joints to the requirements as transverse expansion joints.

3. Construct joints true to line with their faces perpendicular to the surface of the sidewalk. Install the top slightly below the finished surface of the sidewalk. Construct transverse joints at right angles to the centerline of the sidewalk and construct longitudinal joints parallel to the centerline or as directed by the ENGINEER.

4. Place transverse expansion joints, 1/2-inch thick, through the sidewalk at uniform intervals of not more than 50 feet and elsewhere as shown on the Plans, or as directed by the ENGINEER.

5. Place expansion joints, 1/2-inch thick, between the sidewalk and back of abutting parallel curb, buildings or other rigid structures, concrete driveways and driveway approaches. When directed by the ENGINEER, place the expansion joint between sidewalks and buildings 1-foot from the property line and parallel to it.

6. Form plane-of-weakness joints every five (5) feet. Form joints by use of slab division forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to 1/4 the thickness on the sidewalk. Construct cut joints not less than 1/8-inch or more than 1/4-inch in width and finish smooth and at right angles to the centerline on the sidewalk.

E. Placing and Finishing Concrete: Place all concrete on a prepared unfrozen, smooth, leveled, rolled and properly compacted base. Place concrete on a moist surface with no visible water present.

1. Deposit the concrete, in a single layer to the depth specified. Spade or vibrate and compact the concrete to fill in all voids along the forms and joints. Strike off the concrete with a strike board until all voids are removed and the surface has the required grade and cross section as indicated on the Plans, or as directed by the ENGINEER.

2. Float the surface of the concrete just enough to produce a smooth surface free from irregularities. Round all edges and joints with an edger having a 1/4-inch radius.

3. Broom the surface of sidewalks, driveways and approaches to slightly roughen the surface.

4. Texture the surface of the sidewalk ramps with a coarse broom transversely to the ramp slope, and coarser roughen than the remainder of

the sidewalk. Contract the ramp slope in color (using a brick-red dye or approved equal) from the remainder of the sidewalk.

F. Curing: After finishing operations have been completed and immediately after the free water has left the surface, completely coat and seal the surface of the concrete (and sides if slip-forming is used) with a uniform layer of white membrane curing compound. Do not thin the curing compound. Apply the curing compound at the rate of one gallon per 200 square feet of surface.

G. Barricades: Place suitable barricades and lights around all newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter sections in order to protect the new work from damage from pedestrians, vehicles and others until the concrete has hardened.

1. Leave barricades in place for a minimum of two (2) days, except for driveway approaches and curb and gutter sections. Leave barricades in place for a minimum of three (3) days.

2. Remove and replace any concrete that suffers surface or structural damage at no additional cost.

H. Protection:

1. Against Rain: Protect new concrete from the effects of rain before the concrete has sufficiently hardened. Have available on the job site at all times enough burlap or 6-mil thick polyurethane film to cover and protect one day’s work. Stop work and cover completed work when rain appears eminent. As soon as the rain ceases, uncover the concrete and burlap drag the surface where necessary. Apply curing compound to any areas where the compound has been disturbed or washed away.

2. Against Cold Weather: If concrete is placed between December 15 and February 15, have available on the site sufficient amount of clean, dry straw or hay to cover one (1) day’s production. If the temperature reaches 40 degrees F and is falling, place the hay or straw 12 inches thick, immediately after the curing compound is applied.

3. Concrete Temperature Limitations: Do not place concrete when the temperature of the concrete at the point of placement is above 90 degrees F.

I. Cleanup: After the concrete has gained sufficient strength, but no sooner than within 12 hours, remove the fixed forms and backfill the spaces on both sides

with sound earth of topsoil quality. Compact, level and leave backfill in a neat condition.

J. Gutters and Curbs: Construct gutters and curbs in accordance with Section 520 FDOT Standard Specifications for Road and Bridge Construction, latest edition, including supplements.

3.4 FIELD QUALITY CONTROL

A. Concrete Delivery Ticket: Use a ticket system for recording the transportation of concrete from the batching plant to point of delivery. Issue this ticket to the truck operator at the point of loading and give to the ENGINEER upon delivery.

B. Concrete Delivery Rejection: Remove concrete not permitted for inclusion in the work by the ENGINEER from the site. Rejection of concrete will be determined through Field Quality Control and elapsed time from mixer charging to delivery.

C. Concrete Testing at Placement: Perform tests of each batch of concrete delivered, each 50 cubic yards, or whenever consistency appears to vary. The sampling and testing of slump, air content and strength will be performed at no cost to the School District.

1. Sampling: Secure composite samples in accordance with the Method of Sampling Fresh Concrete, ASTM C172.

2. Slump Test: Test in accordance with ASTM C143. Use the least slump possible consistent with workability for proper placing of the various classifications of concrete.

   a. Place structural concrete for walls and slabs, by means of vibratory equipment, with a slump of four (4) inches.
   b. A tolerance of up to 1-inch above the indicated maximum will be allowed for individual batches provided the average for all batches or the most recent ten (10) batches tested, whichever is fewer, does not exceed the maximum limit.

3. Air Content: Determine air content of normal weight concrete in accordance with Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method, ASTM C23 1, or by the volumetric method, ASTM C 173, for each strength test.

4. Compressive Strength: Make two (2) strength tests of three (3) samples each for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one (1) day.

   a. Handling Samples: Mold and cure three (3) specimens from each sample in accordance with Method of Making and Curing Concrete Test Specimens in the Field, ASTM C31. Record any deviations from the requirements of this Standard in the test report.

   b. Testing: Test specimens in accordance with Method of Test for Compressive Strength of Cylindrical Concrete Specimens, ASTM C39. Test one (1) specimen at seven (7) days for information and test two (2) at 28 days for acceptance. Use the average of the strengths of the two (2) specimens tested at 28 days. Discard results if one (1) specimen in a test manifests evidence of improper sampling, molding or testing, and use the strength of the remaining cylinder. Should both specimens in test show any of the above defects, discard the entire test.

   c. Acceptance of Concrete: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified 28-day strength and no individual strength test results falls below the specified 28-day strength by more than 500 psi. If the strength test is not acceptable, perform further testing to qualify the concrete.

   d. Concrete Temperature: Determine the temperature of concrete sample for each strength test.

D. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch and under strength by 200 psi, the total reduction is 20% plus 02% or 40% reduction.

END OF SECTION

SECTION 03 30 00.1 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 REFERENCE STANDARDS

A. ACI 306.1 - Standard Specification for Cold Weather Concreting; 90th Edition, 1998.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

C. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2022a.

D. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2024.

E. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.

F. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

G. ASTM C219 - Standard Terminology Relating to Hydraulic and Other Inorganic Cements; 2024.

H. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2017a.

I. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

J. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2025a.

K. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

L. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

M. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.

N. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

O. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

P. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.

1.4 REFERENCES

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mix water to be withheld for later addition at Project site. This amount shall be indicated on each batch ticket from the concrete plant.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Cementitious materials and aggregates.
   2. Form materials and form-release agents.
   3. Steel reinforcement and reinforcement accessories.
   4. Admixtures.
   5. Curing materials.
   6. Floor and slab treatments.
   7. Bonding agents.
   8. Adhesives.
   9. Vapor retarders.
   10. Epoxy joint filler.
   11. Joint-filler strips.
   12. Repair materials.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
   1. ACI 301, "Specification for Structural Concrete."
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19.05 mm), minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish ties that, when removed, will leave holes not larger than 1 inch (25.4 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

D. Deformed-Steel Wire: ASTM A 496.

E. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

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

C. Joint Dowel Bars: Plain-steel bars, ASTM A615/A615M, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I/II.
   1. Fly Ash: ASTM C618, Class F or C.
   2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   1. Nominal Maximum Aggregate Size: 3/4 inch (19.05 mm).
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/8-inch nominal maximum aggregate size.

D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Catexol 1000CL; Axim Concrete Technologies.
      b. MCI 2000 or MCI 2005; Cortec Corporation.
      c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
      d. Rheocrete 222+; Master Builders, Inc.
      e. FerroGard-901; Sika Corporation.

2.6 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Penetrating Liquid Floor Treatment:
      a. Titan Hard; Burke Group, LLC (The).
      b. Chemisil Plus; ChemMasters.
      c. Intraseal; Conspec Marketing & Manufacturing Co., Inc.
      d. Ashford Formula; Curecrete Chemical Co., Inc.
      e. Day-Chem Sure Hard; Dayton Superior Corporation.
      f. Euco Diamond Hard; Euclid Chemical Co.
      g. Seal Hard; L&M Construction Chemicals, Inc.
      h. Vexcon Starseal PS; Vexcon Chemicals, Inc.

C. Clear, Waterborne, Epoxy Sealer:
   1. Products:
      a. Euclid Chemical Company (The); Eucopoxy Tufcoat VOX.
      b. Nox-Crete Products Group; Dauerseal 30E.
      c. Tamms Industries, Inc.; Dural WB 356.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Curing compound manufacturer to certify that the compound will not interfere with the bonding of the floor covering.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

G. Products: Subject to compliance with requirements, provide one of the following:
   1. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:
      a. Spray-Cure & Seal Plus; ChemMasters.
      b. UV Super Seal; Lambert Corporation.
      c. Lumiseal Plus; L&M Construction Chemicals, Inc.
      d. CS-309/30; W. R. Meadows, Inc.
      e. Seal N Kure 30; Metalcrete Industries.
      f. Rich Seal 31 percent UV; Richmond Screw Anchor Co.
      g. Cure & Seal 31 percent UV; Symons Corporation.
      h. Certi-Vex AC 1315; Vexcon Chemicals, Inc.
   2. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
      a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
      b. Polyseal WB; ChemMasters.
      c. UV Safe Seal; Lambert Corporation.
      d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
      e. Vocomp-30; W. R. Meadows, Inc.
      f. Metcure 30; Metalcrete Industries.
      g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

2.8 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Joint-Filler Strips: ASTM D1752, cork or self-expanding cork.

C. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D2240.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.18 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (6.35 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi (28268.52 kPa) at 28 days when tested according to ASTM C109/C109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.35 mm).
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (6.35 mm) or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5700 psi (39300.13 kPa) at 28 days when tested according to ASTM C109/C109M.

2.10 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Minimum Compressive Strength (28 Days): As indicated on structural drawings.
   2. Maximum W/C Ratio: 0.45
   3. Maximum Slump: 4 inches (101.6 mm), plus or minus 1 inch (25.4 mm).
   4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches (203.2 mm) after admixture is added to concrete with 2- to 4-inch slump.
   5. Air content: 6 percent, plus or minus 1.5 percent at point of placement for 3/4-inch nominal maximum aggregate size.

D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
   1. Minimum Compressive Strength (28 Days): As indicated on structural drawings.
   2. Maximum W/C Ratio: 0.50
   3. Minimum Cementitious Materials Content: 470 ob/cu. ft.
   4. Maximum Slump: 4 inches (101.6 mm), plus or minus 1 inch (25.4 mm).
   5. Air Content: 6 percent, plus or minus 1.5 percent at point of placement for 3/4-inch nominal maximum aggregate size.
   6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

E. Elevated Composite Slabs on Metal Deck: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength (28 Days): As indicated on structural drawings.
   2. Slump Limit: 4 inches (101.6 mm), plus or minus 1 inch (25.4 mm).
   3. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch (9.52 mm).
   4. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch (9.52 mm) or less.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

F. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required to have low water permeability.

G. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist (exterior slab on grade).

H. Do not air entrain concrete to trowel-finished interior floor slabs. Do not allow entrapped air content to exceed 3 percent.

I. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

J. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class C, 1/2 inch (12.7 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms
   1. for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor bolts, accurately located, to elevations required.
   2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees Fahrenheit (10 degrees Celsius) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form- removal operations and provided curing and protection operations are maintained.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire. Concrete block/brick supports are acceptable at foundation footings and slabs. Hooking and pulling reinforcement up during concrete pour is not allowed.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
   1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Water may only be added if the amount withheld from the plant is noted on the batch ticket.
   2. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (609.6 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (152.4 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit (4.44 degrees Celsius), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit (10 degrees Celsius) and not more than 80 degrees Fahrenheit (26.67 degrees Celsius) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees Fahrenheit (32.22 degrees Celsius) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3.18 mm) in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed

surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
   1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
      a. For concrete floors under carpeted areas, specified overall values of flatness, FF25; and levelness, FL20; with minimum local values of flatness, FF17; and levelness, FL15.
      b. For concrete floors under thin-set ceramic, vinyl tile, or similar coverings, specified overall values of flatness, FF35; and levelness, FL25; with minimum local values of flatness, FF23; and levelness, FL17.
      c. For conventional concrete floor surfaces such as mechanical rooms, non-public areas, and surfaces under thick-set tile, specified overall values of flatness, FF20; and levelness, FL15; with minimum local values of flatness, FF15; and levelness, FL12.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

3.9 MISCELLANEOUS CONCRETE ITEMS

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

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

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

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (304.8 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall
    a. within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process

24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than seven days old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Epoxy Sealer Coat: At locations indicated to receive sealer, uniformly apply a continuous epoxy sealing coat to hardened concrete according to manufacturer's written instructions.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches (50.8 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6.35 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch (25.4 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19.05 mm)

clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25.4 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees Fahrenheit (4.44 degrees Celsius) and below and when 80 degrees Fahrenheit (26.67 degrees Celsius) and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
      a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two at 28 days and one at 56 days.
      a. Test one field-cured specimen at 7 days and two at 28 days and one at 56 days.
      b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3447.38 kPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION

SECTION 03 35 00 - CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Clear concrete floor sealer.
   2. Epoxy Coating.
   3. Slip-resistant abrasive aggregate.
   4. Two-part slab to wall expansion joint.

1.3 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.4 ACTION SUBMITTALS

A. Product Data: Provide data on concrete hardener, sealer, and slip resistant treatment, compatibilities, and limitations.

1.5 INFORMATIONAL SUBMITTALS

A. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of specification section - Project Management and Coordination.

B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Temporary Lighting: Provide minimum 200 W light source, 8' above the floor surface, for each 425 sq. ft. of floor being finished.

B. Temporary Heat: Ambient temperature of 50° F (10° C) minimum

C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.8 FIELD CONDITIONS

A. Coordinate work under provisions of specification section - Project Management and Coordination.

B. Coordinate the work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide products by listed manufacturers. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and approval in writing by the Architect is obtained prior to bidding.
   1. H&C Concrete Coatings.
   2. Sherwin Williams Company.
   3. Lambert Corporation.

2.2 CLEAR FLOOR SEALER

A. Clear Sealer (Interior only):
   1. Basis of Design Product: Pro Series High Performance Industrial Clear, high-solids, single-component, aliphatic, moisture-cure urethane coating.

2.3 CLEAR POLYURETHANE FLOOR SEALER

A. Clear Sealer (Interior & Exterior):
   1. Basis of Design Product: Pro Series Water-Based Polyurethane, two-component, 60% solids, breathable aliphatic urethane.

2.4 EPOXY COATING

A. Epoxy floor coating
   1. Basis of Design Product: “Armorseal Water Based Epoxy Floor Coating #8100”
   2. Two-component system with two coats at 5.0 to 12.0 wet mils per coat and 2.0 to 5.0 dry mils per coat.

2.5 SLIP-RESISTANT ADDITIVE

A. Basis of Design Product: “SharkGrip”, micronized polymer.

2.6 ACCESSORIES

A. Concrete slab to wall expansion joints:
   1. Basis of Design Product: Prefabricated “Ceramar” expansion joint with “Snap Cap” removable top as manufactured by W.R. Meadows or equal.
   2. Two (2) part polysulphide sealant as manufactured by Nakoda Enterprises.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

3.2 GENERAL FINISHING

A. See drawings for locations and type of specialized floor finish and treatment in accordance with design intent. Contractor to coordinate with Architect for all field samples and installations.

3.3 FLOOR SURFACE TREATMENT INSTALLATION

A. Apply in multiple coats in accordance with manufacturer's instructions.

B. Apply slip resistant finish in accordance with manufacturer's instructions.

3.4 EXPANSION JOINT INSTALLATION

A. Install expansion joint in accordance with manufacturer's instructions.

B. Install expansion joint level with adjacent concrete surface.

END OF SECTION

DIVISION 03 40 00 - MONOLITHIC OR SECTIONAL PRECAST STRUCTURES

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Rectangular, monolithic, or sectional precast water and wastewater structures, pipe connectors, and accessories,

1.2 RELATED SECTIONS

A. Section 02222 - Excavating.
B. Section 02223 - Backfilling.

1.3 UNIT PRICE - MEASUREMENT & PAYMENT

A. Basis of Measurement:

1. Standard Precast Structure: Measurement for payment will be made from actual field measurements to the nearest one-tenth foot from the top of the base slab to the top of the structure.
2. Transition Precast Structure: Measurement of the Precast Structure bottom portion will be made from actual field measurements to the nearest one-tenth foot from the top of the base slab to the top section of the precast structure. Measurement of the transition assembly will be made from actual field measurements to the nearest one-tenth foot from the top of the precast concrete structure to the top of the transition assembly.
3. Vacuum Tests: Basis of Measurement will be by the Unit.

B. Basis of Payment:

1. Payment for precast structures will be made at the unit prices stated in the proposal and will include excavating, backfilling, furnishing and installation of precast concrete structures, cover, hatches and frame, pipe inlet and outlet connections, invert, and accessories.
2. Payment for Vacuum Tests will be made at the unit prices stated in the proposal and will include successful performance for the test including furnishing all equipment. labor, and material. No payment will be made for Vacuum Tests performed unsuccessfully.

1.4 REFERENCES

A. Prestressed Concrete Institute: Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
B. National Precast Concrete Association: Quality Control Manual for Precast Concrete Plants.

C. American Society for Testing and Materials:
   1. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
   2. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
   3. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
   4. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
   5. ASTM C913 - Standard Specifications for Precast Concrete Water and Wastewater Structures
D. American Association of State Highway and Transportation Officials: Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets (AASHTO M198).

E. American Concrete Institute: Building Code Requirements for Reinforced Concrete (ACI 318).

F. Occupational Safety and Health Administration: Standard 1926704 Requirements for Precast Concrete.

1.5 SUBMITTALS SHALL BE AS FOLLOWS:

A. Completed Certificate from this Specification Section sealed by a Registered Professional Engineer on the staff of the Precast Concrete Manufacturer.

B. Copy of Certificate or Report showing that the Precast Concrete Manufacturer conforms to Article 1.07 of this Section.

C. Schedule of Precast Concrete Components to be provided on the Project, charting the following:
   1. Plan sheet number where the Precast Structure plan and profile are shown.
   2. recast Structure number, station number, or application description.
   3. Invert Elevation of the influent and effluent pipes as shown on the Plans.
   4. Top and bottom elevation of the Precast Structure as shown on the Plans.

5. Top and bottom elevation proposed for the Precast Structure.
6. Total height for the individual and assembled Precast Components.
7. Manufacturer's Part No. Or Catalogue No. and number required of each base. riser, and top to be provided.
8. Each Pipe size and type and its Connector's part number, distance from top of base slab, and horizontal distances from inner wall corners.
9. Other opening or cast-in item descriptions and locations.

D. Detail of each Precast Concrete Component to be provided, sealed by the Registered

Professional Engineer employed by the manufacturer showing or charting the following:

1. Manufacturer's Part No. or Catalogue No.
2. Inside dimensions and lay length.
3. Wall thickness and base or top thickness where applicable.
4. Handling Weight and lift hole or insert or loop description and location.
5. Wire size, spacing. location and steel area per vertical foot.
6. Reinforcing bar grade, size, spacing, and location.
7. Design loads.
8. Concrete Mix No. and design strength.
9. Height, width, slope and annular space of the tongue and groove.

E. Pipe Connector Details. Material Specification and pipe installation procedure.

F. Joint Material Detail, Material Specifications and calculations showing that the joint material cross section is greater than the joint's annular space times its height.

G. Lifting Device and Hole Details that include design loads.

H. At the request of the Engineer or Owner, submit the following:

1. Structural analysis and design calculations for Precast Components, performed in accordance with applicable codes and standards, showing that allowable stresses will not be exceeded. All calculations must be sealed by a Registered Professional Engineer employed by the Precast Concrete Manufacturer.
2. Calculations or test results verifying that the lifting device components and holes are designed in accordance with OSHA Standard 1926.704.
3. Concrete 28-day compression strength results for everyday production of Precast Components for the project was performed, showing the required strength according to the guidelines established in ACI 318.
4. Reinforcing and Cement mill reports for materials used in the manufacture of Precast Components for this project.

5. The above test reports for similar Precast Components for this project.

1.6 QUALIFICATIONS

A. The Precast Manufacturer shall comply with one of the following requirements:

1. Manufacture Precast Components for the project in a plant certified in the Prestressed Concrete Institute's (PCI) Plant Certification Program.
2. Manufacture Precast Components for the project in a plant certified in the National Precast Concrete Association's (NPCA) Plant Certification Program.
3. Retain an independent testing or consulting engineering firm approved by the Engineer for Precast plant inspection. The basis for plant inspection shall be the National Precast Concrete Association Quality Control Manual or the Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products. The above firm shall inspect the precast plant 2 weeks prior to and at 1 week intervals during production of materials for this project and issue a report, certified by a Registered Engineer that materials, methods, products, and quality control meet the requirements of the above quality control manuals.

B. The Precast Manufacturer shall have a recognized Quality Improvement Process installed at the manufacturing facility.

C. The Precast Manufacturer shall employ at least one Registered Professional Engineer at the manufacturing facility through the life of the project.

D. Concrete compressive strength testing shall be performed in a laboratory inspected by the CCRL of the National Bureau of Standards. Testing shall be performed by Grade I AOI Certified Laboratory Technicians or by Level I PCI Certified Technicians.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry, grouting or concreting work.

PART 2- PRODUCTS

2.1 MATERIALS

A. Concrete shall conform to ASTM C478 and as follows:

1. Compressive strength: 5000 psi minimum at 28 days.
2. Air Content: 4 percent minimum.
3. Cementitious Materials: Minimum of 564 pounds per c.y.
4. Coarse Aggregates. ASTM C33. Sound, Crushed, Angular Granitic Stone only. Smooth or rounded stone shall not be used.
5. Fine Aggregates: ASTM C33. Free from organic impurities.
6. Chemical Admixtures: ASTM C494 Calcium Chloride or admixtures containing calcium chloride shall not be used.
7. Air Entraining Admixtures: ASTM C260.

B. Reinforcing steel shall be ASTM A615 grade 60 deformed bar, ASTM A82 wire or ASTM A185 welded wire fabric.

C. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars are not allowed.

D. Butyl Rubber Sealant shall conform to Federal Specification SS-S-210A, AASHTO M-198, Type B - Butyl Rubber and as follows: maximum of 1% volatile matter and suitable for application temperatures between 10- and 100-degrees F.

E. Butyl Rubber with Bentonite Sealant shall contain 99% solids with a maximum of 1% volatile matter and suitable for application temperatures between 5 and 125 degrees F.

F. Epoxy Gels used for interior patching of wall penetrations shall be a 2-component, solvent free, moisture-insensitive, high modulus, high-strength, structural epoxy paste adhesive meeting ASTM C-881, Type land II, Grade 3, Class B and C, Epoxy Resin Adhesive.

2.2 COMPONENTS

A. Precast Component Fabrication and Manufacture shall be as described in this paragraph and as described in the paragraphs for the specific components.

1. Precast Manufacturing shall be in conformance with ASTM C91 3. Wall and inside slab finishes resulting from casting against forms standard for the industry shall be acceptable, except form ties through the wall of the product are not allowed. Exterior slab surfaces shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spalls will be tolerated, Dimensional tolerances shall be those set forth in the appropriate References and as specified below.

2. Joint surfaces on joints between Precast Structure Components shall be keyways or tongue and grooves manufactured to the joint surface design and tolerance requirements of ASTM 0913.
3. Lift Inserts and Holes shall be sized for a precision fit with the lift devices, shall conform to OSHA Standard 1926.704, and shall not penetrate through the precast structure wall.
4. The structural design of Precast Components shall be in accordance with applicable codes and standards listed in Article 1.05 of this Specification Section. No less than 80 psf per foot of depth of Equivalent Fluid Pressure should be used for lateral earth design loads plus the lateral surcharge design loads possible from HS-20 Traffic. Vertical design loads shall include structure dead loads, earth loads, hydrostatic loads, and traffic live loads where applicable with no less than 300 psf live load. The empty and liquid full container conditions shall both be considered.

B. Precast Base Sections shall be cast monolithically without construction joints, or with an approved galvanized or PVC waterstop cast in the cold joint between the base slab and the walls. Where shown on the Project Plans, Base Section Slab Extensions shall be provded on the short sides of the section. The width of the extensions shall be the slab thickness unless shown different.

C. The Minimum Lay Length of Precast Riser Sections shall be 36 inches.

D. Precast Top Sections shall be cast monolithically without construction joints, or with an approved galvanized or PVC waterstop cast in the cold joint between the base slab and the walls. Joints cast on top sections for round manhole Transition Assemblies shall have ASTM 0361 joint surfaces.

E. Pipe To Precast Structure Connectors shall conform to ASTM 0923.

F. Joints between Precast Components shall be sealed with a polyethylene backed flat butyl rubber sheet no less than 1/16 inch thick and 6 inch wide applied to the outside perimeter of the joint. Joints shall also be sealed internally with a sealant having a cross-sectional area no less than the joint annular space times the joint height as follows:

1. Butyl Rubber Sealant in joints with perimeters less than 18 feet.
2. Bentonite impregnated Butyl Rubber Sealant in all other joints.

G. Frames, covers, grates, and hatches shall be equal to those shown on the plans.

H. Lifting Devices for handling Precast Components shall be provided by the Precast Manufacturer and shall comply with OSHA Standard 1926.704.

I. Coatings: Where shown on the Plans, the interior/exterior of the Precast Structure wall shall be coated with 21 mils of Coal Tar Epoxy, Kop-Coat Bitumastic No. 300-M or equal. The coating shall be spray applied according to the manufacturer's recommendations by an applicator with a minimum of 5 years' experience.

J. Coatings: Where shown on the Plans, the interior of the Precast Structure wall shall be coated with 20 mils of Superior SP2000R or equal. The coating shall be spray applied according to the manufacturer's recommendations by an applicator with a minimum of 5 years' experience.

2.3 CONFIGURATION

A. Precast Concrete Structures are to be constructed as specified.
B. The number of joints is to be minimized. Use no more than 2 sections up to 8 depth and no more than 1 additional section for each 4 of depth.
C. Provide inverts conforming to Section 2607, paragraph 2.021 when Rectangular Sewer Manholes are required.
D. Round transition assemblies shall conform to Section 332607.

PART 3- EXECUTION

3.1 EXAMINATION

A. Inspect Precast Components prior to unloading from the delivery truck.

3.2 PREPARATION

A. PRODUCT DELIVERY, STORAGE, AND HANDLING: Coordinate delivery with the manufacturer, handle and store the Precast Components in accordance with ASTM 0891 and the manufacturer's recommendations using methods that will prevent damage to the components and their joint surfaces

3.3 PLACING PRECAST CONCRETE SECTIONS

A. Excavate to the required depth and remove materials that are unstable or unsuitable for a good foundation. Prepare a level, compacted foundation extending 6 beyond the precast base and follows ASTM 0891 excavation standards.

B. Set base plumb and level, aligning pipe opening with pipe invert.

C. Thoroughly clean joint tongue and grooves to remove dirt and other foreign materials that may prevent sealing. Unroll the Butyl Sealant rope directly against

bottom groove. Leave protective wrapper attached until sealant is entirely unrolled against groove. Do not stretch. Overlap from side to side - not top to bottom.

D. Set risers and tops. aligning internal wall surfaces. so that proper alignment is achieved, taking particular care to clean, prepare and seal joints.

E. When recommended by the manufacturer, fill the void between horizontal joint surfaces with a sand cement grout around the outside perimeter as risers are set.

F. After joining precast sections. apply the butyl sealant sheet around the outside perimeter of the joints below grade.

G. Secure Pipe Connectors to Pipe according to the Connector Manufacturer instructions. When pipe stub outs are installed, provide restraint from longitudinal movement before backfill.

H. Lift Holes leaving less than 2’ of wall thickness shall be plugged from the outside using a sand cement mortar and then covered with butyl sealant sheet. Lift holes penetrating the wall shall be additionally sealed with an interior application of an epoxy gel 1/8 thick extending 2’ beyond the penetration.

I. Perform the final finishing to the Structure interior by filling all chips or fractures greater than 1/2 in length, width or depth and depressions more than 1/2 deep in inverts with a sand cement mortar. Clean the interior of the Structure, removing all dirt, spills or other foreign matter.

END OF SECTION

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Steel reinforcing bars.
   4. Masonry-joint reinforcement.
   5. Miscellaneous masonry accessories.
   6. Masonry-cell fill.

1.3 REFERENCE STANDARDS

A. ASCE 5 - Building Code Requirements and Specification for Masonry Structures; 2011.

B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.

F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

I. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

J. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

K. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber; 2020.

L. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

M. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

N. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

O. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

P. ASTM A366 – Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold Rolled.

Q. ASTM A510 – Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

R. ASTM A580 – Standard Specification for Stainless Steel Wire.

S. ASTM C67 – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

T. ASTM C150 – Standard Specification for Portland Cement.

U. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants.

V. ACI 530.1 /ASCE 6/TMS 602 – Specifications for Masonry Structures.

W. National Concrete Masonry Association (NCMA), including “TEK Bulletins.”

X. Portland Cement Association (PCA), “Concrete Masonry Handbook.”

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. CMU.
   2. Reinforced Masonry.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:
   1. CMUs.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: Include material test reports substantiating compliance with requirements. For masonry units, include data and calculations establishing average net-area compressive strength of units.
   1. Integral water repellant used in CMUs.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   3. Mortar admixtures.
   4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   5. Grout mixes. Include description of type and proportions of ingredients.
   6. Reinforcing bars.
   7. Joint reinforcement.
   8. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

E. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

F. Extend cover a minimum of 24 inches (609.6 mm) down both sides of walls and hold cover securely in place.

G. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (609.6 mm) down face next to unconstructed wythe and hold cover in place.

H. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.9 MOCK-UPS

A. Build mock-ups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

B. Build mock-ups for typical exterior wall in sizes approximately 8' high with a right angle corner with a 6' and a 4' leg by full thickness, including face and backup wythes and accessories.
   1. Include a sealant-filled joint at least 16 inches (406.4 mm) long in exterior wall mockup.
   2. Include lower corner of window opening in exterior wall mockup.
   3. Include precast concrete one-piece window sill.
   4. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches (406.4 mm) down from top of mock-up, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
   5. Include water-resistive barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mock-up.

C. Clean one-half of exposed faces of mock-ups with masonry cleaner as indicated.

D. Protect accepted mock-ups from the elements with weather-resistant membrane.

E. Approval of mock-ups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   1. Approval of mock-ups is also for other material and construction qualities specifically approved by Architect in writing.
   2. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

F. Mock-up shall be built separately independent from the structure and shall remain and be maintained during the course of construction.

1.10 PREINSTALLATION MEETINGS

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

1.11 PRECONSTRUCTION TESTING SERVICE

A. A qualified independent testing agency shall perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Testing Prior to Construction: One set of tests.

C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

E. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.13 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills exposed to the exterior with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (609.6 mm) down both sides of walls and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

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

1.14 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

B. Standards: Comply with the most recent edition of the following:
1. National Concrete Masonry Association (NCMA), including “TEK Bulletins”.
2. American Concrete Institute (ACI), ACI 530/ASCE 5/TMS; and ACI 530.1/ASCE 6.
3. Portland Cement Association (PCA), “Concrete Masonry Handbook”.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (609.6 cm) vertically and horizontally of a walking surface.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for units exposed to the exterior.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

C. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi (13,790 kPa).
2. Density Classification: Normal weight.
3. Size 8 x 8 x 16 Nominal: Manufactured to dimensions 3/8 inch (9.52 mm) less-than-nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample, match existing.

2.4 CONCRETE LINTELS

A. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Color: As selected by the Architect.

H. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch (6.35 mm) thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

L. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
   1. Interior Walls: Hot-dip galvanized carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: 0.148-inch interior 0.187-inch exterior diameter.
   4. Wire Size for Cross Rods: 0.148-inch interior 0.187-inch exterior diameter.
   5. Spacing of Cross Rods: Not more than 16 inches (406.4 mm) o.c.
   6. Provide in lengths of not less than 10 feet (304.8 cm), with prefabricated corner and tee units.

2.7 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
   2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
   3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch thick steel sheet, galvanized after fabrication.
      a. 4-inch thick, galvanized-steel sheet may be used at interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
   3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22.22 mm) wide with corrugations having a wave length of 0.3 to 0.5 inch (12.7 mm) and an amplitude of 0.06 to 0.10 inch (2.54 mm) made from 0.075-inch thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
      a. 4-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.

E. Partition Top Anchors: 0.105-inch thick metal plate with a 3/8-inch diameter metal rod 6 inches (152.4 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (609.6 mm) long, with ends turned up 2 inches (50.8 mm) or with cross pins unless otherwise indicated.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.8 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use one of the following unless otherwise indicated:
   1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

a. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch thick coating of adhesive.
b. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches (38 mm) from edge.
    1) Color: Gray.
c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637/D 4637M, 0.040 inch (1.02 mm) thick.

B. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge[or elastomeric thermoplastic flashing with a drip edge.

C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Use masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use masonry cement mortar.
4. For reinforced masonry, use masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry Type M or Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476.
   3. Provide grout with a slump of 8 to 11 inches (279.4 mm) as measured according to ASTM C 143/C 143M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that reinforcing dowels are properly placed.
   3. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12.7 mm) or minus 1/4 inch (6.35 mm).
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12.7 mm).
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6.35 mm) in a story height or 1/2 inch (12.7 mm) total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm) maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch (3.18 mm) in 10 feet (304.8 cm) maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm) maximum.
   4. For lines and surfaces, do not vary from straight by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm) maximum.
   5. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm) maximum.
   6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.59 mm).

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.18 mm), with a maximum thickness limited to 1/2 inch (12.7 mm).

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3.18 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9.52 mm) or minus 1/4 inch (6.35 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.18 mm).

3.4 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond or bond to match existing; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50.8 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches (609.6 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches (1219.2 mm) o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6.35 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

C. Tool exposed joints to match existing or slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

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

E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (15.88 mm) on exterior side of walls, 1/2 inch (12.7 mm) elsewhere. Lap reinforcement a minimum of 6 inches (152.4 mm).
   1. Space reinforcement not more than 16 inches (406.4 mm) o.c.
   2. Space reinforcement not more than 8 inches (203.2 mm) o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches (203.2 mm) above and below wall openings and extending 12 inches (304.8 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Provide an open space not less than 1/2 inch (12.7 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches (609.6 mm) o.c. vertically and 36 inches (914.4 mm) o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

A. Provide concrete lintels where shown and where openings of more than 12 inches (304.8 mm) for brick-size units and 24 inches (609.6 mm) for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches (203.2 mm) at each jamb unless otherwise indicated.

3.10 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer].
   2. At lintels, extend flashing a minimum of 6 inches (152.4 mm) into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches (50.8 mm) to form end dams.
   3. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.12 MASONRY WASTE DISPOSAL

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

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches (101.6 mm) in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in specification section "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches (457.2 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

This page intentionally left blank

SECTION 04 42 00 - EXTERIOR STONE CLADDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Stone wall panels.
   2. Stone wall trim units.
   3. Stone attachment accessories.

1.3 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2023).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

G. ASTM C119 - Standard Terminology Relating to Dimension Stone; 2022.

H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

I. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2022.

J. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2022a.

K. ASTM C1354/C1354M - Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone; 2022 Edition, January 1, 2022.

L. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

M. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

N. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

O. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

P. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

Q. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.

R. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

S. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2022.

T. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

U. ASTM A36 – Standard Specification for Carbon Structural Steel.

V. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.

W. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.

X. ASTM C880/C880M – Standard Test Method for Flexural Strength of Dimension Stone.

Y. ASTM C1201/C1201M – Standard Test Method for Structural Performance of Exterior Dimension Stone Cladding Systems by Uniform Static Air Pressure Difference.

Z. ASTM C97/C97 – Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.

AA. ASTM C99/C99M – Standard Test Method for Modulus of Rupture of Dimension Stone.

BB. ASTM C170/C170M – Standard Test Method for Compressive Strength of Dimension Stone.

CC. ASTM F436 – Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.
   1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
   2. Include details of sealant joints.
   3. Show locations and details of anchors.
   4. Show direction of veining, grain, or other directional pattern.
   5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

C. Stone Samples for Verification: Sets for variety, color, and finish of stone required; not less than 12 inches (304.8 mm) square.
   1. Sets shall consist of at least five (5) Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.
   2. Sealant Samples for Verification: For type and color of joint sealant required.

D. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design requirements signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Material Test Reports:
   1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three (3) years.
   2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.

3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in specification section "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

C. Preconstruction test reports.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Stone Units: Furnish 5% finished stone panels for finish and variety of stone specified.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance for a period not less than ten (10) years.

B. Installer Qualifications: A firm or individual experienced in installing stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance. For a period not less than five (5) years.

C. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.9 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

B. Build mockups of typical exterior wall area not less than 72 inches (1828.8 mm) long by 48 inches (1219.2 mm) high.
   1. Include typical components, attachments to building structure, and methods of installation.
   2. Include window opening with stone returns and trim.
   3. Include sealant-filled joint complying with requirements in specification section "Joint Sealants."
   4. Include an area that has been damaged and repaired.

C. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PREINSTALLATION MEETINGS

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of thirty (30) days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

1.11 PRECONSTRUCTION TESTING

A. Preconstruction Stone Testing Service: Engage a qualified testing agency to perform preconstruction testing.
   1. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
   2. Furnish test specimens that are representative of materials proposed for incorporation into the Work.
   3. Physical Property Tests: For each stone variety proposed for use on Project, tested for compliance with physical property requirements, other than abrasion resistance, according to referenced ASTM standards.

4. Flexural Strength Tests: For stone variety, thickness, orientation of cut, and finish, proposed for use on Project, tested according to ASTM C 880/C 880M, in both wet and dry conditions.
5. Anchorage Tests: For stone variety, orientation of cut, finish, and anchor type proposed for use on Project, tested according to ASTM C1354/C1354M.
6. Anchoring System Mockup Test: For stone anchoring system, tested according to ASTM C 1201/C 1201M, Procedure B, with a maximum test load equal to 3 times the design load. Build laboratory mockup at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site. Mockup shall consist of one panel 72 inches (1828.8 mm) long by 48 inches (1219.2 mm) high in size.

B. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and specification section "Joint Sealants," Samples of materials that will contact or affect joint sealants.

C. Preconstruction Field Testing of Sealants: Before installing joint sealants, field test their adhesion to joint substrates according to specification section "Joint Sealants."

1.12 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
2. Store stone on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

1.13 FIELD CONDITIONS

A. Protect stone cladding during erection by doing the following:
1. Cover tops of stone cladding installation with non-staining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches (609.6 mm) down both sides and hold securely in place.
2. Prevent staining of stone from sealants and other sources. Immediately remove such materials without damaging stone.
3. Protect base of walls from rain-splashed mud by coverings spread on ground and over wall surface.
4. Protect sills, ledges, and projections from sealant droppings.

B. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

C. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

D. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by stone cladding Installer for anchoring, supporting, and

flashing of stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.

E. Time delivery and installation of stone cladding to avoid extended on-site storage and to coordinate with work adjacent to stone cladding.

1.14 PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C1242.
   1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.

B. Structural Performance: Stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Wind Loads: As indicated on structural drawings.
   2. Equipment Loads: Allow for loads due to window cleaning and maintenance equipment.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.

E. Shrinkage and Creep: Allow for progressive vertical shortening of building frame.

F. Safety Factors for Stone: Design stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
   1. Safety Factor for Oolitic Limestone: 8.
   2. Safety Factor for Concentrated Stresses: For stone varieties other than granite.

G. Design stone anchors to withstand loads indicated without exceeding allowable working stresses established by the following:
   1. For Structural Steel: AISC 360.
   2. For Cold-Formed Steel: AISI's "North American Specification and Commentary for the Design of Cold-Formed Steel Structural Members."
   3. For Cold-Formed Stainless Steel: ASCE/SEI 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
   4. For Aluminum: AA ADM-1, "The Aluminum Design Manual."
   5. For Cast-in-Place and Post-installed Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
   6. For Post-installed Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.

H. Limit deflection in each prefabricated assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than 1/720 of assembly's clear span or the following, whichever is smaller:
   1. 1/16 inch (1.59 mm), measured in plane of wall.
   2. 1/4 inch (6.35 mm), measured perpendicular to wall.

I. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system.

J. Provision for Deflection of Building Structure:
   1. Deflection Due to Weight of Stone Cladding Assembly: Allow for 1/4-inch vertical deflection in 20-foot span of structural members supporting stone cladding assembly.
   2. Live Load Deflection: Allow for 1/4-inch vertical deflection, in 20-foot (6-m) span of structural members supporting stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.

K. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of stone and joint materials.

PART 2 PRODUCTS

2.1 STONE CLADDING

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Indiana Limestone Company: www.indianalimestonecompany.com/#sle.
   2. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

B. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
   1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
   2. Make quarried blocks available for examination by Architect.

C. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

2.2 LIMESTONE

A. Material Standard:
   1. Complies with ASTM C568/C568M, Type II, Medium Density Classification.
   2. Variety: Indiana Limestone.
   3. Absorption by Weight: 7.5 maximum percentage; ASTM C97/C97M.
   4. Density: 135 lbs/cu ft, minimum; ASTM C97/C97M.
   5. Compressive Strength: 4000 psi (27579.04 kPa), minimum; ASTM C170/C170M.
   6. Modulus of Rupture: 700 psi (4826.33 kPa), minimum; ASTM C99/C99M.

B. Description: Oolitic limestone.

C. Varieties and Sources: Subject to compliance with requirements, provide the following.
   1. 3D Stone, Bloomington, Indiana.

D. Varieties and Sources: Indiana limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
   1. Indiana Limestone Grade and Color: Variegated, according to grade and color classification established by ILI.

E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

F. Finish: Smooth finish.

G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

H. Thickness: Not less than 4 inches (101.6 mm) unless otherwise indicated.

2.3 ANCHORS AND FASTENERS

A. Fabricate anchors, including shelf angles, from stainless steel, ASTM A240/A240M or ASTM A666, Type 316; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 316.

B. Fabricate shelf angles for limestone from hot-dip galvanized steel, ASTM A36/A36M for materials and ASTM A123/A123M for galvanizing.

C. Post-installed Anchor Bolts for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 for bolts and nuts; ASTM A666, Type 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
   1. For stainless steel, use annealed stainless-steel bolts, nuts, and washers; for bolts, ASTM F593; and for nuts, ASTM F594, Alloy.
   2. For galvanized-steel shelf angles, use carbon-steel bolts, nuts, and washers; for bolts, ASTM A307, Grade A; for nuts, ASTM A 563, Grade A; and for washers, ASTM F 436; all hot-dip or mechanically zinc coated.

2.4 STONE ACCESSORIES

A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, non-staining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Setting Buttons: Resilient plastic buttons, non-staining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch (0.4 mm) thick, and complying with specification section"Sheet Metal Flashing and Trim."

D. Weep and Vent Tubes: Rectangular, cellular, polypropylene 3/8" W. x 2-1/2" D. x 3-3/8" L. of length required to extend from exterior face of stone to cavity behind.
   1. Basis of Design: “No. 3601 Cell Vent” as manufactured by Wire Bond.
      a. Color: As selected by the Architect.

E. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in specification section "Joint Sealants" and do not stain stone:
   1. Joint Sealant: Silicone, non-staining, S, NS, 100/50, NT.
   2. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

F. Sealant for Filling Kerfs: Same sealant used for joints in stone cladding.

G. Stone Sealer: Provide “Sure Klean Weather Sealer” as manufactured by Prosoco.

2.5 STONE FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
   1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
   2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
   3. For marble, serpentine, and travertine, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."

B. Control depth of stone and back check to maintain minimum clearance as indicated on the drawings between backs of stone units and surfaces, backup walls, and other work behind stone.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

F. Quirk-miter corners unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.

G. Cut stone to produce uniform joints 1/2 inch (12.7 mm) wide and in locations indicated.

H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

I. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.
   1. Produce moldings and molded edges with machines that use abrasive shaping wheels made to reverse contour of molding shape.

J. Clean backs of stone to remove rust stains, iron particles, and stone dust.

K. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
   1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive stone cladding and conditions under which stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone cladding.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone cladding.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING STONE CLADDING, GENERAL

A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

B. Coat limestone with dampproofing to extent indicated below:
   1. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
   2. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.

C. Parge back of travertine panels with mortar not less than 3/8 inch (9.52 mm) thick.

D. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
   1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.

E. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

F. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust

anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing expansion and other joints is specified in specification section "Joint Sealants."
   2. Keep expansion joints free of mortar and other rigid materials.

H. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches (152.4 mm) at ends and turn up not less than 2 inches (50.8 mm) to form end dams.

I. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
   1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches (609.6 mm). Use cell vent.
   2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet (609.6 cm) vertically. Locate vents in joints at intervals not exceeding 60 inches (1524 mm) horizontally. Use cell vent.

3.3 SETTING MECHANICALLY ANCHORED STONE CLADDING

A. Set stone cladding with mechanical anchors without mortar unless otherwise indicated.

B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C1242.

C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.4 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in specification section "Joint Sealants."

3.5 SEALER INSTALLATION

A. Apply sealer per manufacturer’s written instructions.

3.6 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch (6.35 mm) in 10 feet (304.8 cm), 3/8 inch (9.52 mm) in 20 feet (609.6 cm), or 1/2 inch (12.7 mm) in 40 feet (1219.2 cm) or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch (3.18 mm) in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.

B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 3/8 inch (9.52 mm) maximum.

C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch (6.35 mm) in 20 feet (609.6 cm) or 1/2 inch (12.7 mm) in 40 feet (1219.2 cm) or more.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch (6.35 mm).

E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3.18 mm) or a quarter of nominal joint width, whichever is less. For joints within 60 inches (1524 mm) of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.

F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.7 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and stone cladding that does not match approved samples and mock-ups. Damaged stone may be repaired if Architect approves methods and results.

B. Replace damaged or defective work in a manner that results in stone cladding's matching approved samples and mock-ups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone cladding as work progresses. Remove excess sealant and smears as sealant is installed.

D. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION

SECTION 04 43 16 - STONE FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Fabricated stone items:
   1. Limestone columns.
   2. Limestone watertable.
   3. Granite base.
   4. Slate pavers.

B. Metal anchors and supports.

C. Sealing exterior joints.

D. Pointing interior joints.

E. Related Sections:
   1. For stone wall panel cladding, see Specification Section 04 42 00 - Exterior Stone Cladding.
   2. Section 07 92 00 - Joint Sealants: Sealing perimeter and expansion joints in interior stone work.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

D. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023b.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

F. ASTM C119 - Standard Terminology Relating to Dimension Stone; 2022.

G. ASTM C503/C503M - Standard Specification for Marble Dimension Stone; 2023.

H. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2022.

I. ASTM C615/C615M - Standard Specification for Granite Dimension Stone; 2018, with Editorial Revision.

J. ASTM C616/C616M - Standard Specification for Quartz-Based Dimension Stone; 2022.

K. ASTM C629/C629M - Standard Specification for Slate Dimension Stone; 2022.

L. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

M. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

N. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

O. ASTM C1527/C1527M - Standard Specification for Travertine Dimension Stone; 2011 (Reapproved 2018).

P. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone; 2020.

Q. ILI (HB) - Indiana Limestone Handbook; 2007.

R. NBGQA (SPEC) - Specifications for Architectural Granite, Version 18-1; 2018.

S. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Provide data on each stone type, mortar products, and sealant products.

B. Shop Drawings: Indicate fabrication details, layout, pertinent dimensions, anchorages, and jointing methods.
   1. Include large scale details of decorative surfaces and inscriptions.

C. Samples: Submit two stone samples, indicating color range and texture, markings, and surface finish.

D. Samples: Submit mortar color samples.

E. Installation Instructions: Submit stone fabricator's installation instructions and field erection or setting drawings; indicate stone identifying marks and locations on setting drawings.

F. Designer's qualification statement.

G. Stone fabricator's qualification statement.

H. Installer's qualification statement.

I. NSI Installer Qualification: Documentation of Natural Stone Institute Accreditation.

1.6 QUALITY ASSURANCE

A. Design anchors and supports under direct supervision of a Professional Structural Engineer, registered in South Carolina.
   1. Design anchors to resist positive and negative wind pressures and other loads as required by applicable code.
   2. Design anchor attachment to stone with a factor of safety of 5:1.
   3. Design each individual anchor with a factor of safety in the vertical dead-load-bearing direction of 4:1 and in the horizontal lateral-load-bearing direction of 2:1.

B. Limestone: Perform work in accordance with ILI (HB).

C. Granite: Perform work in accordance with NBGQA (SPEC).

D. Maintain one copy of each document on site.

E. Stone Fabricator: Company specializing in fabricating stone with minimum ten years of documented experience.

F. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by stone fabricator.

G. Installer Qualifications: Natural Stone Institute (NSI) Accredited Commercial B Contractor (light commercial); www.naturalstoneinstitute.org/#sle.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.8 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Construct stone fabrication mock-up, including stone anchor accessories, flashings, and typical control joints.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store stone on planks, pallets, or timbers, clear of soil and soil splash.

B. Protect stone from discoloration.

C. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with nonstaining waterproof coverings, securely anchored.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Oolitic Limestone: Indiana Limestone Company: www.indianalimestonecompany.com/#sle
   2. Granite: Cold Spring Granite Company: www.coldspringusa.com/#sle.
   3. Slate: Structural Slate Company: www.structuralslate.com/#sle.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 FABRICATED ITEMS

A. Stone, General: See recommendations in ASTM C1528/C1528M.

B. Oolitic Limestone (Columns and Watertable)
   1. Comply with ASTM C568/C568MClassification II - Medium Density.
   2. Grade: ILI Standard.
   3. Color: Buff.
   4. Grain Direction: Vertical.
   5. Surface Finish: Honed; as described in ASTM C119 and ASTM C1528/C1528M.
   6. Column Facing Thickness: 3/8 inch (9.5 mm).
   7. Shaft, Cap, and Base Construction: Two corner halves.
   8. Size, Shape, and Configuration: As indicated on drawings.

C. Granite Base
   1. Comply with ASTM C615/C615M.
   2. Surface Finish: Honed; as described in ASTM C119 and ASTM C1528/C1528M.

D. Slate Pavers
   1. Comply with ASTM C629/C629MClassification I - Exterior.
   2. Color: Gray.
   3. Surface Finish: Honed; as described in ASTM C119 and ASTM C1528/C1528M.
   4. Size: 24 x 36 inches, unless otherwise indicated.
   5. Thickness: 1 inch.

2.3 MORTAR

A. ASTM C270, Type N, Proportion specification, using Portland cement.

B. Color: As selected by Architect.

2.4 ANCHORS AND ACCESSORIES

A. Anchors and Other Components in Contact with Stone: Stainless steel, ASTM A666 Type 304.
   1. Sizes and configurations: As required for vertical and horizontal support of stone and applicable loads.
   2. Wire ties are not permitted.

B. Support Components not in Contact with Stone: Stainless steel, ASTM A240/A240M Type 304.

C. Setting Buttons and Shims: Lead type.

D. Flashings: Thruwall flashing with weeps at granite base.

E. Joint Filler: Closed cell foam.

F. Bond Breaker: 10 mil (0.25 mm) thick plastic sheet.

G. Joint Sealant: ASTM C920 silicone sealant with movement capability of at least plus/minus 25 percent and nonstaining to stone when tested in accordance with ASTM C1248.

H. Joint Backer Rod: ASTM C1330 open cell polyurethane of size 40 to 50 percent larger in diameter than joint width.

I. Back Coating: Cementitious parging of mortar.

J. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.5 STONE FABRICATION

A. Fabricate stone elements in sizes and shapes as necessary and in compliance with requirements indicated on drawings and in specifications.

B. Cut and drill depressed areas and holes in stones for anchors, fasteners, supports, and lifting devices as indicated or as necessary to set stonework securely in place; shape beds to fit supports. Allow room for expansion of the anchoring devices where necessary.

C. Fabricate profiled stone work, including washes and drips, to produce stone shapes with uniform profile throughout their entire length and with precisely formed arises slightly eased to prevent snipping, and matched at joints between units.

D. Carve and cut decorative surfaces and inscriptions to conform with drawings or models approved by Architect, and employ skilled stone carvers experienced in successful performance of work similar to that being specified.

E. Finish exposed faces and edges of stones in compliance with indicated requirements for finish under each type and application of stone required and to match approved samples and mock-ups.

F. Tolerances: Provide connections that allow for fabrication, erection, and structural deflection tolerances.

G. Cut stones to fabricate pieces of thickness, size, and shape as indicated or required for this work within fabrication tolerances recommended by ILI (HB).

H. Fabricate units for uniform coloration between adjacent units and over the full area of the installation.

I. Where corner detail is not indicated, form external corners to quirk joint profile.

J. Fabricate for 3/8 inch (10 mm) beds and joints.

K. Slope exposed top surfaces of stone and horizontal sill surfaces for natural wash.

L. Cut drip slot in bottom surface of work projecting more than 1/2 inch (13 mm) over wall openings. Size slot not less than 3/8 inch (10 mm) wide and 1/4 inch (6 mm) deep; full width of projection.

M. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.

B. Verify that built-in items are properly located and sized.

3.2 PREPARATION

A. Clean stone prior to erection. Do not use wire brushes or implements that will mark or damage exposed surfaces.

B. Coat back surfaces with back coating. Allow coating to cure.

3.3 INSTALLATION

A. Install flashings of longest practical length and seal watertight to back-up. Lap end joint minimum 6 inches (150 mm) and seal watertight.

B. Erect stone in accordance with stone supplier's instructions and erection drawings.

C. Set stone with a consistent joint width of 3/8 inch (9 mm).

D. Set all cornices, copings, projecting belt courses, other projecting courses, steps, and platforms with unfilled vertical joints. After setting, insert properly sized backup material or backer rod to proper depth, and install sealant.

E. Install weep/cavity vents in vertical stone joints horizontally, immediately above horizontal flashings, above shelf angles and supports, at bottom of walls, and at top of each cavity space; do not permit mortar accumulation in cavity space.

F. Fill anchor holes with non-staining mortar or sealant.

G. Joints in Exterior Work: Seal joints with joint sealant over backer rod, following sealant manufacturer's instructions; tool sealant surface to concave profile.

H. Joints in Interior Work: Leave perimeter joints and expansion joints open for sealant; fill other joints with pointing mortar; pack and work into voids; tool surface to concave joint.

3.4 TOLERANCES

A. Positioning of Elements: Maximum 1/4 inch (6 mm) from true position.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet (6 mm in 3 m); 1/2 inch in 50 feet (13 mm in 15 m).

C. Maximum Variation Between Face Plane of Adjacent Panels: 1/16 inch (1.5 mm).

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story noncumulative; 1/2 inch (13 mm) in any two stories.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet (3 mm in 1 m); 1/4 inch in 10 feet (6 mm in 3 m); 1/2 inch (13 mm) maximum.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet (3 mm in 1 m).

3.5 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting any item not so indicated on drawings.

B. Do not impair appearance or strength of stone work by cutting.

3.6 CLEANING

A. Remove excess joint material upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Use nonmetallic tools in cleaning operations.

END OF SECTION

This page intentionally left blank

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to the following metal fabrications:
   1. Miscellaneous metal fabrications including, but not limited to:
      a. Anchor bolts, steel pipe sleeves, Slotted-channel inserts, and wedge-type inserts cast into concrete, or built into unit masonry.
      b. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
   2. Rough hardware.
   3. Miscellaneous Steel Trim.
   4. Miscellaneous Aluminum Trim.
   5. Steel Weld Plates and Angles.
   6. Loose Bearing and Leveling Plates.
   7. Loose Steel Lintels.
   8. Ladders:
      a. Ships Ladders.
   9. Countertop Supports.
   10. Mop Sink Wall Guard.
   11. Bar Gratings.
   12. Abrasive Nosings.
   13. Downspout Shrouds.
   14. Fasteners/Anchors.
   15. Miscellaneous Framing and Supports for the following, but not limited to:
      a. Mechanical and electrical equipment.
      b. Wall brackets for:
         1) Mechanical and electrical equipment.
         2) TV monitors.
         3) Shelving.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

G. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low- Alloy, Hot-Rolled and Cold-Rolled, General Requirements for; 2019a.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

I. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

K. MFMA-4 - Metal Framing Standards Publication; 2004.

L. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024.

M. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

N. SSPC – Steel Structure Painting Council - Steel Structures Painting Council.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

P. ASTM A48/A48M – Standard Specification for Gray Iron Castings.

Q. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.

R. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

S. ASTM A276/A276M – Standard Specification for Stainless Steel Bars and Shapes.

T. ASTM A283 – Carbon Steel Plates, Shapes, and Bars.

U. ASTM A312/A312M – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

V. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

W. ASTM A480 – Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

X. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

Y. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

Z. ASTM A513/A513M – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

AA. ASTM A554 – Standard Specification for Welded Stainless Steel Mechanical Tubing.

BB. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

CC. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

DD. ASTM A743/A743M – Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.

EE. ASTM A747/A747M – Standard Specification for Steel Castings, Stainless, Precipitation Hardening.

FF. ASTM A793 – Standard Specification for Rolled Floor Plate, Stainless Steel.

GG. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

HH. ASTM A 1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

II. ASTM B26 – Standard Specification for Aluminum-Alloy Sand Castings.

JJ. ASTM B85 – Standard Specification for Aluminum-Alloy Die Castings.

KK. ASTM B177 – Standard Guide for Engineering Chromium Electroplating.

LL. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

MM. ASTM B210 – Standard Specification for Aluminum-Alloy Drawn Seamless Tubes.

NN. ASTM B211 – Standard Specification for Aluminum-Alloy Bar, Rod and Wire.

OO. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

PP. ASTM C1011/C1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

QQ. ASTM F594 – Standard Specification for Stainless Steel Nuts.

RR. ASTM F1941 – Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.

SS. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series); 2012 (Reaffirmed 2021).

TT. ASME B18.6.3 - Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series); 13th Edition, 2017.

UU. AAMA 204 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

VV. AAMA 606.1 – Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.

WW. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

XX. AAMA 608.1 – Voluntary Guide Specifications and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.

YY. AWS – Structural Welding Code.

ZZ. OSHA 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product data for products: 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.

B. Shop drawings detailing fabrication and erection of each metal fabrication indicated.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections.
   2. Show anchorage and accessory items.
   3. Provide templates for anchors and bolts specified for installation under other sections.
   4. Show overall dimensions (width, height). Supporting construction requirements and equipment structural attachment. Operating range and required clearances.

C. Delegated-Design Submittal: Submit design calculations for load bearing elements, analysis data and shop drawings indicating compliance with dedicated design requirements signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welder current certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

D. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Paint Compatibility: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Manufacturer experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Trained, certified and approved by manufacturer, with documented experience on similar projects.

C. Welding Standards: Comply with applicable provisions of AWS "Structural Welding Code."
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

D. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

E. Welder Certification:
   1. General Contractor is responsible for obtaining and retaining welder certifications for any person performing on-site welded steel fabrication or erection. The certifications must be current and validated by welding logs or certification test(s) conducted with the last two (2) years.

F. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
   1. See Concrete and Masonry Sections of these Specifications for installation of inserts and anchorage devices.

G. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

1.8 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.

1.9 FIELD CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

C. 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.

1.10 COORDINATION

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

C. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

D. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.11 PERFORMANCE

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Delegated-Design Submittal: Contractor shall engage a qualified professional engineer, licensed in the State of South Carolina, to design calculations, analysis data, and shop drawings - indicating compliance with dedicated design requirements, and signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

PART 2 PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General:
   1. Provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
   2. For metal fabrications exposed to view in the completed Work, do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

E. Zinc-Coated Steel Wire Rope: ASTM A 741.

F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: 1-5/8 by 1-5/8 inches and as indicated on drawings.
   2. Galvanized steel, ASTM A653, commercial steel, Type B or structural steel, Grade 33, with G90 coating; specify nominal thickness.
   3. Cold-rolled steel, ASTM A1008 commercial steel, Type B or structural steel, Grade 33, hot-dip galvanized after fabrication.
   4. Cold-rolled steel, ASTM A 1008/A 1008M, coated with rust-inhibitive, baked-on, acrylic enamel.

H. Stainless Steel:
   1. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316L.
   2. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 or Type 316L.
   3. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
   4. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

2.3 NON-FERROUS METALS

A. Aluminum:
   1. General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
   2. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
   3. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
   4. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
   5. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
   6. Extruded Structural Pipe Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
   7. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
   8. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

2.4 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 100 deg F (55.5 deg C).

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds wherever possible. Use exposed fasteners of type indicated or, if not indicated, use Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

I. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.

J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

K. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

M. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

N. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.5 ROUGH HARDWARE

A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 06 Sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.6 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible and grind welds smooth and finish flush where exposed to view.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work.
1. Provide integrally welded steel strap anchors, welded to steel trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.

C. Galvanize miscellaneous exterior steel trim and at indicated interior locations.

2.7 MISCELLANEOUS ALUMINUM TRIM

A. Unless otherwise indicated, fabricate units from extruded aluminum shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible and grind welds smooth and finish flush when exposed to view.

B. Provide anchorages as required to coordinate assembly and installation with other work and if exposed approved by the Architect.

2.8 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 LOOSE BEARING AND LEVELING PLATES:

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area.

B. Drill plates to receive anchor bolts and for grouting as required.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

2.11 SHIPS LADDERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. FS Industries.
      a. Basis of Design Product: Model no. SL24116.
   2. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Substitution Procedures regarding requirements of substitutions to be considered.

B. Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3 and OSHA 1910.23.

C. Incline: 68 degrees or as indicated on drawings.

D. Support each ladder at top with welded or bolted steel brackets, Size brackets to support design dead and live loads per delegated design.

E. Siderails:
   1. Continuous, steel channel stringer or bent plate, spaced 24" apart.
   2. See Drawings for size.
   3. Finish/Color: As selected by Architect.

F. Treads:
   1. Tread material: Steel; Bar grating.
   2. Size: See Drawings for tread size.
   3. Spacing: 12" apart maximum.
   4. Finish/Color: As selected by Architect.
   5. Fit treads in centerline of side rails, weld fully, and grind smooth.

G. Handrail:
   1. See Drawings for shape, size, and gauge information.
   2. Finish/Color: As selected by Architect.
   3. Weld to stringer at both ends.

2.12 COUNTERTOP SUPPORTS

A. Provide stainless steel countertop supports for wall mounted countertops from 14-gauge sheet steel.

B. Provide a triangle brace with top horizontal length two thirds of countertop depth and vertical portion to be secured to wall to be one half of countertop length.

C. Fold all edge with 1″ fold and all exposed edges to be hemmed.

D. Supports shall be located at 30" o.c.

E. Surface mounted counter support brackets:
   1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
      a. Rangine Corporation.
         1) Basis of Design Product: “Rakks EH-Inside Wall Mount Counter Support Bracket”
            (a) (CS-1) Model #EH-1212FM, 12” x 14” bracket, supports 430#.
            (b) (CS-2) Model #EH-1818FM, 18” x 20” bracket, supports 300#.
            (c) (CS-3) Model #EH-1824FM, 18” x 26” bracket, supports 300#.
      b. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with Section 01 25 13.0 – Substitution Procedures regarding requirements of substitutions to be considered.
   2. Fabricated from 2” x 2” x 0.188” thick aluminum.
   3. Finish: As selected by the Architect.

F. Hidden countertop brackets:
   1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
      a. Centerline Brackets.
         1) Basis of Design Product: “Hidden Countertop Supports”
            (a) (CS-4) Model #CSA-0008-12.
      b. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with Section 01 25 13.0 – Substitution Procedures regarding requirements of substitutions to be considered.

G. Fabricated from 1/2" thick x 2 1/2" wide x 12" long steel.

H. Finish: As selected by the Architect.

2.13 MOP SINK WALL GUARD

A. Provide custom fabricated 20-gauge stainless steel wall guard behind the mop sink.

B. Guard to start at top of mop sink and extend up wall to 36” above finished floor.

C. The guard shall be located on both walls behind the mop sink and extend 6” beyond edge of mop sink and extend down to top of wall base.

D. Edges shall have a 1/4" 10-degree brake.

2.14 BAR GRATINGS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Alabama Metal Industries Corp.
   2. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 25 13.0 – Substitution Procedures regarding requirements of substitutions to be considered.

B. Bearing Bars:
   1. Rectangular steel bars of an appropriate depth and thickness for the required load, on 1-3/16" centers.
   2. Other available centers are which may be selected at the discretion of the Architect/Engineer.
   3. Cross Bars: Twisted wire rod, at 4" on center, resistance welded to the bearing bars and at right angles to them.
   4. Surface: The bearing bars shall have a serrated top surface.
   5. Loading: The uniform load shall be designed so deflection shall not exceed 1/4 inch over the required span.

2.15 DOWNSPOUT SHROUDS

A. Diamond Plate: 1/4-inch thick aluminum.

B. Size and Configuration: See drawings.

2.16 FASTENERS/ANCHORS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts:
   1. Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and where indicated, flat washers.
   2. Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.

D. Screws:
   1. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
   2. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

E. Washers:
   1. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
   2. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

F. Anchors:
   1. General:
      a. Provide for anchorage of type indicated; Coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
      b. Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

2. Cast-in-Place Anchors in Concrete:
   a. Either threaded type or wedge type unless otherwise indicated; Galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
3. Cast into Concrete or built into Masonry:
   a. Equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6- inchembedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.
4. Post-Installed Anchors: Torque-controlled expansion anchors.
   a. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
   b. (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
5. Anchor Bolts:
   a. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
      1) Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
6. Epoxy chemical set hot-dipped alloy steel B7 conforming to ASTM A193 of dimensions required to comply with delegated design and flat washers. Chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

G. Slotted-Channel Inserts:
1. Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, indicated with anchor straps or studs.
2. Size: 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long, at not more than 8 inches o.c.
3. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

H. Concrete Inserts:
1. Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27.
2. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A153.

2.17 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports not specified in other Sections as needed to complete the Work.

B. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
1. Equip units with integrally welded anchors for casting into concrete or building into masonry.
2. Furnish inserts if units must be installed after concrete is placed.
3. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
4. Fabricate units from slotted channel framing where indicated.

D. In addition to miscellaneous framing and supports provide specialized framing for the following:
1. Mechanical and electrical equipment.
2. Wall brackets for:

a. Mechanical and electrical equipment.
b. TV monitors.
c. Shelving.

3. Metal framing for Electrical support systems: If electrical equipment is attached to support framing, the Electrical Contractor will provide and install that metal framing.

2.18 ACCESSORIES

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.19 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Provide products by listed manufacturers. However, products of other manufacturers will be considered for acceptance, if they equal or exceed the material requirements and functional qualities of the specified product, and approval in writing by the Architect is obtained prior to bidding:

1. Dayton Superior Corp.
   a. Basis of Design Product: Sure-grip High Performance Grout.
2. Five Star Products.
   a. Basis of Design Product: Five Star Grout.
3. Master Builders Technologies, Inc.
   a. Basis of Design Product: Masterflow 928 and 713.
4. W. R. Meadows, Inc.
   a. Basis of Design: Sealtight 588 Grout.

2.20 CONCRETE FILL

A. Concrete Materials and Properties:

1. Comply with requirements of Specification Section “Cast-in-Place Concrete,” for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.

2.21 FINISHES, GENERAL

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. All sections, including Aluminum surfaces, shall be free of scratches and other serious surface blemishes and chemically cleaned.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Finish metal fabrications after assembly.

E. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79 (Alkyd, Anti-Corrosive for Metal), and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2.22 FINISHES, STEEL AND IRON

A. Prepare surfaces to be primed in accordance with SSPC SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Do not prime surfaces in where field welding is required.

D. Interior Steel Members: Prime paint items with one coat.

E. Exterior Steel Members:
   1. Galvanizing requirements: All exterior ferrous metals shall be hot-dip galvanized after fabrication. Galvanize after fabrication to ASTM A123/A123M.
   2. Provide minimum G90 galvanized coating.

F. Paint
   1. Shop prime iron and steel items not indicated to be galvanized, unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   2. Shop Primers: Provide primers that comply with Division 09 painting Sections.
      a. Provide products by listed manufacturers. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and approval in writing by the Architect is obtained prior to bidding.
         1) Carboline.
         2) Ameron.
            (a) Basis of Design Product:
               (1) Tnemec Tneme-Zinc 90-97 or equal.
               (2) Epoxy Zinc-Rich Primer: Complying with MPI #20 (Zinc Rich, Epoxy), and compatible with topcoat.
   3. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
      a. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
      b. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
      c. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
      d. Other Items: SSPC-SP 3, "Power Tool Cleaning."
   4. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
      a. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   5. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
   6. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M, formulated for 30-mil thickness per coat.
   7. Coordinate standard shop primers normally provided with the finish paint specifications for these items in Painting specifications. Metal fabricator will be required to provide the primers as specified in Painting specifications. All items scheduled to receive finish coats as specified in Painting specifications shall be prepared for primer in accordance with SSPC - SP 6, Commercial Blast Cleaning, or SSPC - SP3, Power Tool Cleaning, as recommended by the manufacturer for the types of primers installed.

G. Stainless Steel: #4 Satin.

2.23 FINISHES, ALUMINUM

A. Aluminum Surfaces: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

B. Finish: To be selected by the Architect.

C. Clear Anodic Finish: Class 1, AAMA 611, AA-M12C22A41, Mechanical finish, nonspecular as fabricated, chemical finish, 0.7 mils or thicker.

D. Colored Anodic Finish: Class 2, AAMA 611, AA-M12C22A32/A34, Mechanical finish, nonspecular as fabricated, integral colored, chemical finish, 0.4 mils or thicker. Verify availability with manufacturers selected.
   1. Color: As selected by Architect.

E. High-Performance Organic Finish Two-Coat Fluoropolymer: Chemical Finish Organic Coating, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight. Complying with paint manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces to comply with AAMA 2604.
   1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

F. High-Performance Organic Finish Three-Coat Fluoropolymer: Chemical Finish Organic Coating, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight. Complying with paint manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces to comply with AAMA 2605.
   1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

2.24 FINISHES, MISCELLANEOUS

A. Loose Bearing and Leveling Plates:
   1. Galvanize plates after fabrication.

B. Loose Steel Lintels:
   1. Galvanize loose steel lintels located in exterior walls.

C. Steel Ladders:
   1. Galvanize ladders at interior locations where indicated.

D. Bar Grating:
   1. Manufacturers standard shop galvanized.

E. Miscellaneous Framing and Supports:
   1. Galvanize miscellaneous framing and supports in exterior walls.

PART 3 EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which equipment, miscellaneous and ornamental items are to be installed. Notify the Architect and Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Do not begin installation until the substrates have been properly prepared.

3.2 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.

C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

D. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

E. Use of Ink marking pens on surfaces of any kind of materials is prohibited. Experience has shown that such marks bleed through paint and other finishes.

3.3 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's instructions.

B. Fastening to In-Place Construction:
   1. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

F. Field Welding:
   1. Comply with the following requirements:
      a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      b. Obtain fusion without undercut or overlap.
      c. Remove welding flux immediately.
      d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

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

H. Before Substantial Completion, conduct a demonstration in the presence of the Owner's representative to ensure that all equipment operates properly in every aspect. Conduct a detailed user/operator training session at time and place agreed upon by Owner's representative.

3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.5 INSTALLING LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set bearing and loose leveling plates on wedges, shims, leveling nuts, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
   1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture.
   2. Use non-shrink grout, non-metallic grout in exposed locations, unless otherwise indicated.
   3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 INSTALLING LINTELS FOR PLUMBING, HVAC, AND ELECTRICAL EQUIPMENT:

A. The General Contractor shall furnish lintels for all openings through walls when openings are shown on the architectural or structural (General Contract) drawings. All such lintels and openings require coordination of work and exact locations, by affected contractors. Refer to the Architectural and Structural Drawings for coordination.

3.7 INSTALLING LADDERS

A. CMU/Concrete Walls: Ladder to be attached directly to floor and wall.

B. Metal Stud Partitions: Ladder to be attached directly to floor and wall. Required stud thickness and / or solid blocking requirement shall be included in the delegated design for attachment.

3.8 ADJUSTING, CLEANING AND PROTECTION

A. Touch-up, repair or replace damaged products before Substantial Completion.

B. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint.
   2. Paint uncoated and abraded exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
   3. Apply by brush or spray, to provide a 2.0-mil minimum dry film thickness.

C. Touchup Painting:
   1. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint is specified in Division 09 painting Sections.

D. Galvanized Surfaces:
   1. Clean welds, bolted connections, and abraded areas.
   2. Apply galvanizing repair paint to comply with ASTM A780.

E. Protect installed products until completion of project.

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Steel pipe tube railings and accessories.

1.3 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

I. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).

J. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.

K. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

L. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

M. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

N. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2022.

O. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

P. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024.

Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

R. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

S. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

T. ASTM A500 – Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

U. ASTM A501 – Standard Specification for Hot Formed Welded and Seamless Carbon Steel Structural Tubing.

V. AWS – Structural Welding Code.

W. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.

X. ACSE 7 – Loads on Handrails and Guards.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For the railings, brackets and items indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
   1. Fittings and brackets.
   2. Indicate method of connecting members at intersections.

E. Assembled sample of railing system, made from full-size components, including handrail. Sample need not be full height.
   1. Show connection of members at intersections.

F. Delegated-Design Submittal: Contractor shall engage a qualified professional engineer, licensed in the State of South Carolina, to design calculations, analysis data, and shop drawings - indicating compliance with dedicated design requirements, and signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATION SUBMITTALS

A. Welder current certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

B. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS - "Structural Welding Code."

C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.8 MOCK-UP

A. Provide a non-installed mock-up consisting of a complete 4’-0” long full height section consisting of a mounting post, intermediate post, linear railing members, handrails, top rails, balusters, attached fittings and bracket all in the finish required.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Coordination installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items

with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.10 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on performance requirements.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

C. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

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

E. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity, horizontal, uniform and concentrated loads and stresses within limits and under conditions indicated as indicated by applicable codes.

F. Delegated-Design: Contractor shall engage a qualified professional engineer, licensed in the State of South Carolina, to design calculations, analysis data, and shop drawings - indicating compliance with dedicated design requirements, and signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. American Stair Corporation.
   2. Alfab, Inc.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 STEEL RAILING

A. Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand design loads.
   1. Handrails, Rails, and Posts: See drawings for size and gauge.
   2. Lower Rails: See drawings for size and gauge.

B. Railing Welded Connections: Fabricate railings with welded connections.

C. Railing Connections: Fabricate railings with internal fitting connections.

D. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
   1. For railings, provide ferrous-metal fittings, brackets, fasteners, and sleeves, except provide galvanized anchors embedded in exterior masonry and concrete construction.
   2. Fasteners for Interconnecting Railing Components: Provide concealed spigots and fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.3 FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
   1. Frame construction: Prepare backing plate for mounting in wall.
   2. Exposed Fasteners: Flush countersunk screws or bolts consistent with design of railing.

B. Fasteners for Interconnecting Railing Components: Provide concealed cast spigots and fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

C. Bolts, Nuts, and Washers: ASTM A325 or A307, for exterior components galvanize to G90 per ASTM A153/A153M.

D. Toggle Bolts: Tumble-wing type, FS-FF-B-588, type, class and style as required.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   1. For exterior provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs and stairs indicated to be shop primed with zinc-rich primer.

F. Post-Installed Chemical Anchors: Epoxy chemical set hot-dipped alloy steel B7 conforming to ASTM A193 of dimensions required to comply with delegated design and flat washers. Chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

G. Post-Installed Torque-controlled Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Interior: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5, unless otherwise indicated.
   2. Exterior: Alloy stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

H. Provide adjustable brackets and flanges, with aluminum inserts for casting in concrete where indicated.

2.4 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Pipe: To ASTM A53 Type E or S, Grade B.

D. Steel Tubing: ASTM A 500 (cold formed).

E. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

F. Brackets, Flanges and Anchors: Cast or formed metal of same type of material and finish as supported rails unless indicated otherwise.

2.5 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, formulated for 30-mil thickness per coat.

E. Welding Materials: AWS; type required for welded materials, provide metal type as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

F. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads. Railings shall be fabricated by one manufacture.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (0.79 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   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 flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
   5. Form changes in directions by bending or utilizing prefabricated elbow fittings.
   6. Connect members where required with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Form changes in directions by inserting prefabricated elbow fittings.

G. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6.35 mm) or less.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

L. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

M. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 2 1/4-inch clearance from inside face of handrail to finished wall surface.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

P. Fillers: Provide fillers made from plate material, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

Q. Fabricate system to accommodate railing anchor plates.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Provide exposed fasteners and brackets with a finish matching appearance matching the railings, unless indicated otherwise.

C. Exterior Stairs:
   1. Exterior Stairs and Railing Galvanizing: Hot-dip galvanize items to G90 as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   2. High-Performance Organic Finish: 3-coat fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

D. Interior Stairs:
   1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No.3, "Commercial Blast Cleaning." minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products.
   2. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel", for shop painting.
   3. Finish: Paint per Painting Specification.

E. Baked-Enamel or Powder-Coated Finish: AAMA 2604 except with a minimum dry film thickness of 1.5 mils (0.0381 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch (1.59 mm) in 3 feet (91.44 cm).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch (6.35 mm) in 12 feet (365.76 cm).

C. Corrosion Protection: Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

F. Do not store handrails at jobsite.

3.3 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (127 mm) deep and 3/4 inch (19.05 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
   1. 1. Do not core drill for posts located on top of concrete precast or site cast walls. Posts at these locations shall have base plates and be surface mounted.

B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

C. Use cast pipe sleeves preset and anchored into concrete for installing exterior railing.

3.4 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 2 1/4-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.5 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

This page intentionally left blank

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Section includes rough carpentry, light hardware, and miscellaneous items of work not included in another Section. This Section also includes:
   1. Structural wood supports, grounds, backing, and blocking required for millwork and casework items that are an integral part of wall, floor, and/or ceiling construction.
   2. Plywood sheathing.

1.3 REFERENCE STANDARDS

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

B. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 QUALITY ASSURANCE

A. Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, AWPB, or by other grading and inspection agencies acceptable to Architect. Grade marks shall include the designation "S-DRY"(or "MC-15" as applies) where applicable. Grade and quality marks shall not be apparent on surfaces exposed in the finished work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store kiln dried materials in enclosed areas, protected from moisture and separated from contact with concrete or soil.

PART 2 PRODUCTS

2.1 MATERIALS

A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth, as usage requires.

B. Lumber Not Otherwise Specified or Noted:
   1. Douglas fir or larch, graded and grademarked, according to Reference Standard 1.02 A or B, #1 grade:
      a. Boards: Construction grade.

C. Sill Plates (On Concrete): Construction grade light framing, pressure treated as hereinafter specified; as indicated on Drawings.

D. Plywood for Walls as Indicated on Drawings:
   1. Unless glue type is otherwise specified, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.
   2. Unless glue type is otherwise specified, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.
   3. Equipment Backing Panels:

a. Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels, and for products not manufactured under PS 1 provisions, with APA PRP-108 trademark. Furnish construction panels that are each factory-marked with APA trademark.
b. Panels: Paint exterior AC plywood 3/4" thick with fire retardant paint “Firefree Class A” as manufactured by Firefree Coatings, Inc.

E. Plywood for Walls and Roofs as Indicated on Drawings:
1. Unless glue type is otherwise specified, exterior plywood, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.
2. Unless glue type is otherwise specified, exterior plywood, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.
3. Equipment Backing Panels:
a. Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels, and for products not manufactured under PS 1 provisions, with APA PRP-108 trademark. Furnish construction panels that are each factory-marked with APA trademark.
b. Panels: Paint exterior AC plywood 3/4" thick with fire retardant paint “Firefree Class A” as manufactured by Firefree Coatings, Inc.

F. Rough Hardware:
1. Nails, spikes, bolts, screws, tacks, and framing connectors of standard manufacture as required. Hot dip galvanize items exposed to moisture or to exterior and those items that are in contact with wood pressure treated with waterborne salts:
a. Bolts and Nuts: ASTM A307, Grade A.
b. Lag Bolts: Fed. Spec. FF-B-561. Pre-drill per CBC.
c. Nails: Fed. Spec. FF-N-101, common unless otherwise noted or specified.
d. Joist Hangers and Framing Connectors: Simpson or approved equal, unless otherwise noted.
e. Wood Screws: ASME B18.6.1.
f. Screws for Fastening to Metal Framing: ASTM C 954, except with wafer heads and reamer wins, length as recommended by screw manufacturer for material being fastened.
g. Power Driven Fasteners: Hilti, Ramset, or approved equal, each use and fastener type subject to prior approval of Architect.

G. Pressure Treatment (Decay and Termite Prevention):
1. Pressure treat for decay and termite prevention, Douglas fir or larch wood materials that are embedded in or set against concrete.
2. Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.
3. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
4. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:
a. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
c. Wood framing members less than 18 inches above grade.
d. Wood floor plates installed over concrete slabs directly in contact with earth.

5. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.
6. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
7. Treat in accordance with Reference Standard 1.02 E and quality mark as per Reference Standard 1.02 F.
8. Treat with any of the following processes at Contractor option. Creosote type preservatives are not permitted:
   a. Penta in an LPG carrier (Cellon) or Penta in Hydrocarbon Solvent-Type D (Dow Process) AWPB LP-4 quality marked.
   b. Ammoniacal copper arsenate (ACA) or chromated copper arsenate (CCA) in a water carrier (AWPB LP-2 quality marked).
   c. Disodium Octaborate Tetrahydrate (DOT) such as Advance Guard/Hi-bor by Osmose, Inc.
   d. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19 percent after treatment.
9. Where possible, precut material before treatment.
10. Holes and cutoffs and handling and storage shall be in accordance with AWPA M-4.
11. Ensure that ferrous metal fastenings and items in contact with wood treated with waterborne salts are hot dip galvanized (1.25 oz. coating) where required by ICC reports.

H. Framing Connectors: Simpson Strong Tie Corp., or equal.

2.2 MOISTURE CONTENT

A. 19 percent maximum for two times thickness and less; 19 percent maximum for thickness greater than two times and less than four times; and 22 percent maximum for thickness greater than four times.

2.3 SIZES

A. Surfaced to "DRY" sizes. Sizes noted are nominal unless shown as net.

2.4 SURFACING

A. All wood materials exposed in the finished work shall have re-sawn surfaces of clean natural color unless noted or specified otherwise. Concealed framing lumber shall be S4S.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

A. Framing:
   1. Properly lay out framing with pieces closely fitted, accurately plumbed, leveled and aligned, and rigidly secured in place.

B. Bridging and Blocking:
   1. Provide two times blocking at intersections of finished surfaces for adequate bearing and at points where required to support fixtures, cabinets, hardware, and other equipment mounted on walls.

C. Plywood (General): Unless more stringent requirements are indicated on the Drawings or required by code, application of plywood shall be in accordance with recommendations of the American Plywood Association.

D. Connections and Fastenings:

1. For bolted connections, provide washers under heads and nuts bearing on wood, and draw nuts tight. Retighten before closing in framing.
2. Exercise care in nailing through exposed sheathing and siding and ensure that fasteners penetrate into framing members.

E. Wood Blocking: Wood blocking shall be provided for all surface mounted items including but not limited to door hardware, toilet accessories, and wall mounted millwork.

F. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.

G. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

H. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.

I. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

J. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.

K. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

END OF SECTION

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Wood blocking, and nailers.

1.3 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

B. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

E. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.

F. PS 20 - American Softwood Lumber Standard; 2021.

G. Voluntary Product Standards PS-20 and PS-1.

H. ALSC - American Lumber Standards Committee - Softwood Lumber Standards.

I. EWA - The Engineered Wood Association.

J. Grading rules of Southern Pine.

K. APA - American Plywood Association.

L. ANSI/APA - American National Standards Institute/American Plywood Association.

M. HPVA HP-1 - Hardwood Plywood and Veneer Association.

N. AFPA - American Forest and Paper Association.

O. AWPA P5 - Standard for Waterborne Preservatives.

P. ASTM C653/C653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

Q. MFMA - Metal Framing Manufacturer's Association - Guidelines for the Use of Metal Framing.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Boards or Strips.
   2. Dimension Lumber.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.7 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.
   4. Post-installed anchors.
   5. Metal framing anchors.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 SHEATHING AND PLYWOOD BACKING

A. Equipment Backing Panels: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels, and for products not manufactured under PS 1 provisions, with APA PRP-108 trademark. Furnish construction panels that are each factory-marked with APA trademark.
   1. Panels: Paint exterior AC plywood 3/4" thick with fire retardant paint “Firefree Class A” as manufactured by Firefree Coatings, Inc.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and 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 (320.04 cm) beyond the centerline of the burners at any time during the test.
1. Treatment shall not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.

2.5 DIMENSION LUMBER FRAMING

A. Hem-fir (north); NLGA.

B. Mixed southern pine or southern pine; SPIB.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Furring.
3. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Screws for Fastening to Metal Framing: ASTM C 1002 length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
1. Use for interior locations unless otherwise indicated.

B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.91 mm) thick.
1. Use for wood-preservative-treated lumber and where indicated.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.
1. Use for exterior locations and where indicated.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than [16] inches ([406.4] mm) o.c.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim. Install fire-retardant-treated materials with classification marking of testing agency in concealed spaces.
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406.4 mm) o.c.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

This page intentionally left blank

SECTION 06 16 00 - SHEATHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Wall Sheathing.
   2. Roof Plywood Sheathing.

1.3 REFERENCE STANDARDS

A. ALSC – American Lumber Standards Committee – Softwood Lumber Standards.

B. EWA – The Engineered Wood Association.

C. APA – American Plywood Association.

D. AFPA – American Forest and Paper Association.

E. ANSI/APA – American National Standards Institute/American Plywood Association.

F. Voluntary Product Standards PS 1.

G. Grading rules of Southern Pine.

H. ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.

I. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

J. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

K. ASTM C1280 – Standard Specification for Application of Gypsum Sheathing.

L. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

M. ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

N. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

O. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

P. APA (American Plywood Association).

Q. AWPA U1 – Use Category System- User Specification for Treated Wood.

R. MFMA (Metal Framing Manufacturer’s Association) – Guidelines for the Use of Metal Framing.

S. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

T. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

U. 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.

V. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

W. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven.

X. PS-1 - Structural Plywood; 2009 (Revised 2019).

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

1.6 INFORMATIONAL SUBMITTALS

A. Product certificates signed by manufacturer certifying that products comply with specified requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Evaluation Reports: For the following, from ICC-ES:
   1. Fire-retardant-treated wood.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect material during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

B. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.8 WARRANTY

A. Provide manufacturers standard Lifetime limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Georgia Pacific Wood Products, LLC.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 GENERAL

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated on drawings.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING

A. Oriented Strand Board (OSB)
   1. Basis of Design Product: "Blue Ribbon® OSB" sheathing panels.
   2. Thickness: 1/2 inch.
   3. Edges: Square.
   4. Span Rating: Not less than 24/0.
   5. Length/Width Tolerance ±1/16″ (±1.6 mm).
   6. Straightness Tolerance ±1/16″ (±1.6 mm).
   7. Squareness Tolerance ±1/8″ (±3.2 mm).
   8. Testing Agency APA® – The Engineered Wood Association.
   9. Classification: Exposure 1 – Rated sheathing suitable for uses not permanently exposed to the weather. Panels classified as Exposure 1 are intended to resist the effects of mositure on structural performance as may occur due to construction delays, or other conditions of similar severity
   10. Code Fire Classification Class III or C.
   11. Flame Spread Rating 76-200, smoke-developed index <450.
   12. Building Code Compliance PS 2-10.

2.4 ROOF PLYWOOD SHEATHING

A. Manufacturers shall be one of the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Georgia Pacific Wood Products, LLC.
   2. Louisiana Pacific Plywood Corp.
   3. Weyerhaeuser NR Company.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

C. Plywood Sheathing: Comply with PS 1, exterior structural 1 sheathing with grade stamps.
   1. Thickness: 5/8 inch (15.88 mm).
   2. Width: 4 feet (121.92 cm).
   3. Length: 8 feet (243.84 cm).
   4. Edges: Square.

2.5 BUILDING PAPER

A. Building Paper: Comply with ASTM D226, Type 1 (No. 15 asphalt-saturated organic felt) unperforated.

2.6 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and 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 (320.04 cm) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all plywood unless indicated otherwise.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture and compliance with product approval where applicable.
   1. Provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Treated Wood: Provide stainless steel fasteners of a type and size required for attachment.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with applicable building codes.

D. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD SHEATHING INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of fasteners for structural-use panels and applications indicated.

B. Installation of Construction Panels
   1. Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide – Residential & Commercial," for types of construction panels and applications indicated.
   2. Attach panels to suspension system.

3.3 BUILDING PAPER INSTALLATION

A. General: Cover sheathing with weather-resistant sheathing paper as follows:
   1. Cut back barrier 1/2 inch (12.7 mm) on each side of the break in supporting members at expansion- or control-joint locations.
   2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

B. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

END OF SECTION

This page intentionally left blank

SECTION 06 41 13 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Wood-veneer-faced architectural cabinets.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. BHMA A156.9 - Cabinet Hardware; 2020.

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2021.

F. REFERENCES

G. Plywood Product Standards: Comply with PS 1 (ANSI A199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard PRP-108 for type of panel indicated.

H. ANSI/APA (American National Standards Institute/American Plywood Association).

I. AWI – Quality Standards.

J. FED MMM-A-130 – Adhesive, Contact.

K. Voluntary Product Standards PS 20-70.

L. Grading rules of Southern Pine.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in cabinets.
   4. Apply AWI Quality Certification Program label to Shop Drawings.

B. Samples for Initial Selection:
   1. Shop applied transparent finishes.

1.6 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Contractor Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five (5) years.

B. Manufacturer Qualifications: Employ only manufacturers with at least five (5) years experience making the specified materials as a current catalog and regular production item.

C. Source Limitations: Provide products of the same manufacturer for all cabinets.

D. All cabinets shall comply with AWI's Woodwork Quality Standards for grades of interior architectural woodwork, construction, finishes and other requirements.
   1. Provide AWS Certificate with shop drawings indicating that the woodwork complies with the requirements of the grades specified.
   2. Provide written documentation that the project has been registered as an AWI/QCP Guarantee and Inspection Service program (GIS) and the project is given an inspection number supplied by AWI.

1.8 MOCK-UP

A. Contractor shall submit a sample of the Cabinet. If the sample deviates from the specification and Design Criteria in any way, the Contractor must submit a substitution request. If the product is comparable to the specification, the Contractor must submit a comparable product request.

B. Sample does not have to be full scale but large enough to display all the materials listed in this standard to include: fronts, tops, backs, sides laminate, shelf, pulls, slides, backing, rails, hinges, base, doors and drawers.
   1. The sample may be an on-site mock-up and may be used as part of work upon Architect and Owner approval.

1.9 WARRANTY

A. Cabinet Manufacturer shall warrant all casework products against manufacturing defects in materials and workmanship for a period of five (5) years.

B. Manufacturer shall warrant against structural failure of the cabinet body for a period of ten (10) years.

C. Installers Warranty: The installer shall warrant the entire installation against defects in material and workmanship for a period of five (5) years.

D. Duration of all warranties shall begin on the date of Substantial Completion.

E. Products will be repaired or replaced by manufacturer, without cost to the Owner.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. All cabinets shall be manufactured in a climate-controlled environment, stored after fabrication in a climate controlled (temperature and humidity) storage area and shipped to the jobsite in an enclosed container (semi-tractor trailer).

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on

Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

E. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

1.12 WARRANTY

A. Cabinet Manufacturer shall warrant all casework products against manufacturing defects in materials and workmanship for a period of five (5) years.

B. Manufacturer shall warrant against structural failure of the cabinet body for a period of ten (10) years.

C. Installers Warranty: The installer shall warrant the entire installation against defects in material and workmanship for a period of one (1) year.

D. Duration of all warranties shall begin on the date of Substantial Completion.

E. Products will be repaired or replaced by manufacturer, without cost to the Owner.

1.13 PERFORMANCE REQUIREMENTS

A. Manufacturers shall have independently tested their products and be able to submit documentation of results indicating compliance with AWI Performance Duty Level 3 as a minimum for structural performance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fabricators: Fabricators shall provide products subject to compliance with requirements and criteria as indicated.

2.2 WOOD-VENEER-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom Premium

C. Type of Construction: Frameless Face Frame

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay Reveal overlay.

E. Wood for Exposed Surfaces: As indicated.

1. Species: White Red Oak, Birch Grade AA, as selected by the Architect.
2. Cut: Rift sliced.
3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
4. Matching of Veneer Leaves: Slip match.
5. Veneer Matching within Panel Face: Center-balance match.

F. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

G. Drawer Construction: Fabricate with exposed fronts fastened to sub-front with mounting screws from interior of body.
   1. Join sub-fronts, backs, and sides with glued rabbeted joint s supplemented by mechanical fasteners.

2.3 MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Wood Moisture Content: 5 to 10 percent.

B. Core Material:
   1. Provide millwork or casework plywood cores of hardwood plywood “Veneer Core” Grade AA, with no-added-Urea Formaldehyde adhesives.
      a. Use 3/4" thick, closed-grain hardwood plywood typical unless noted otherwise.
      b. Use 1/4" thick hardwood plywood at indicated locations.
   2. Marine Grade Plywood: Specially designed panel made entirely of Douglas-fir or Western Larch at sink cabinets. The grade of all plies of veneer is B or better. Exposure rating is EXTERIOR and the glue used is a fully waterproof structural adhesive.
   3. Lumber: Solid wood hardwood, kiln-dried, select Poplar, Fir, or Grade III mill option (Framing).

2.4 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

B. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 HARDWARE

A. Hinges: Steel Institutional 2-3/4-inch, five-knuckle with interlaying leaves, 0.095-inch-thick metal with hospital tips. European Style 170 degree opening.
   1. Semi-concealed Hospital Tip Hinges for Flush Doors: BHMA A156.9, B01361.

B. Door Catches: Provide magnetic, self-aligning or heavy duty, spring loaded, large 11/16" diameter roller mounted catch at bottom edge of door to protect adjacent surfaces that are within the door swing. All doors over 48" in height shall have top and bottom catches.

C. Pulls: Solid 5" stainless-steel wire pulls 2, fastened from back with two screws. Provide two pulls for drawers more than 24 inches (609.6 mm) wide. Pull design shall comply with Americans with Disability Act (ADA).
   1. Match existing.

D. Adjustable Shelf Supports: Recessed shelf standards with adjustable metal clips, K&V 255 standards and 256 supports or approved equal.

E. Shelf Supports: Two-pin-locking plastic shelf rests complying with BHMA A156.9, Type B04013.

F. Shelf Supports: L-shaped 0.25” metal pin shelf rests complying with BHMA A156.9, Type B04013.

G. Adjustable Shelf Supports: Injection molded polycarbonate (clear color), friction fit into cabinet and panels and vertical dividers, adjustable on 1 1/4" centers. Each shelf support with two (2)

integral supports pins, 0.2 inch (5 mm) diameter, to interface pre-drilled holes and prevent accidental rotation of support. Supports automatically adaptable to 3/4" or 1" thick shelving and provide non-tip feature for shelving. Supports are designed to readily permit field fixing of shelf if desired. In lieu of above, provide 1/4" diameter holes at 1 1/4" o.c. vertically to receive Hafele Type “H” nickel-plated shelf clamp supports (four per shelf). Shelving 3-feet wide or wider shall be 1-inch thick.

H. Drawer Slides: Standard clear zinc finish, ball bearing rollers, and 100 pounds dynamic load, Model #8400 by K&V or approved equal and for file drawers 150 pounds dynamic load, Model #8600 by K&V or approved equal. Drawer Slides: Accuride standard clear zinc finish, ball bearing rollers and 100 pounds dynamic load, Model #3301 or approved equal.

I. Locks: Cylinder type with 5-disc tumbler mechanism and keyed to room entry door. Locks shall be provided where shown on the drawings. Provide on all doors and drawers, on pair of doors the left leaf shall be provided with a concealed spring-loaded manual latch and the lock shall be located on the right door. Each area or room shall be keyed alike.

J. Door and Drawer Silencers: Clear soft-stem bumpers #32479 as manufactured by Rockler Woodworking & Hardware or approved equal. Provide at all doors and drawers.

K. Finish: Satin stainless steel US 32D.

L. Heavy duty shelf brackets. Factory finished steel sheet.
   1. Steel thickness: 1/8 inch (3.18 mm).
   2. Minimum loading capacity: 1000 pounds.
   3. Size: As indicated on drawings.
   4. Finish: Textured powder coat.
   5. Color: To be selected by Architect from manufacturer’s standard color selections.

2.6 CABINET CONSTRUCTION

A. Cabinet Case Cores:
   1. Cabinets Case Core: 3/4” veneer faced plywood.
   2. Base: 4- inch high, 3/4” inch veneer core plywood.
   3. Bottoms: 3/4” veneer core plywood glued and doweled to cabinet sides.

B. Cabinet Backs: Shall be fully bound (dadoed) into sides, top and bottom, recessed 7/8" from the cabinet rear. Rear, unexposed side of back shall be toe-nailed to cabinet body with mechanical fasteners and solidified with a continuous bead of industrial grade hot melt adhesive to withstand a bond test as described in ANSI/WDMA I.W.1A. All cabinet backs shall have a minimum of two - 3/4 inch (19.05 mm) x 4" laminate clad flush mounting blocks (hang rails).

C. Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide 2 hang rails at wall cabinet, 1 hang rail at base cabinet and three hang rails at tall cabinets.

D. Doors/Drawer Fronts:
   1. Front: 3/4” inch veneer core plywood.
   2. Edge: Match veneer on all exposed cut edges.

E. Shelving: 1" thick plywood, maximum 36" unsupported width.
   1. Shelf: 1” inch veneer core plywood.
   2. Edge: Match veneer on all exposed cut edges.

F. Drawer
   1. Bottom: 1/2" hardwood plywood, fully bound (dadoed) into front, sides and back.
      a. Body to include sides, back and sub-front 1/2” hardwood plywood.

G. Construction Tolerances
   1. Gap between doors, drawers, panels and frames shall be 1/8".

H. Miscellaneous Materials:
   1. Furring, blocking, shims, and hanging strips.

2. Anchors
3. Adhesives
4. Edging to match veneer on all exposed cut edges.

I. Countertops: See specification section Stone Countertops.

2.7 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. General: Shop finish transparent-finished architectural wood cabinets at fabrication shop as specified in this Section. Refer to “Interior Painting" specification section for field finishing opaque-finished architectural woodwork.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Transparent Finish:
1. Grade: Custom.
2. Finish: System – 12, water-based polyurethane.
3. Staining: None required.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Filled Finish for Open-Grain Woods: After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Do not start installation until the building is enclosed and the HVAC system controls the temperature and humidity (75 degrees, 55 RH) in the room space.

B. Erect the cabinets plumb, level, true and straight with no distortions. Install countertops shall be installed to with-in 1/8-inch of level in a 10-foot length.

C. All cabinet faces shall be plumb and true from door face to door face. There shall be no side hanging or non-plumb doors. Seams shall be flush.

D. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

E. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk, and filled flush with woodwork.
1. Use filler matching finish of items being installed.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch (3.18 mm) in 96-inch (0.12 inch (3 mm) in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (406.4 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

H. Special Installation Procedure/Adjustment Procedures
1. Provide all items and accessories as required for a total and complete installation in every respect.
2. Proceed with installation only after unsatisfactory conditions have been corrected. Installation of any items indicates all conditions are satisfactory and acceptance of previous Work by other Contractors.
3. Adjust cabinets and hardware so that doors and drawers operate smoothly.

3.3 CLEANING

A. All modular cabinet surfaces shall be cleaned of construction spoils, dirt, spills, dust, and stains. The modular cabinet manufacturer shall recommend cleaning solvent. Clean all surfaces, edges, and cabinet interiors.

B. Remove and dispose of all packing materials and related construction debris.

C. Protection: Protect casework from damage during construction until date of Substantial Completion, replace damaged work.

END OF SECTION

This page intentionally left blank

SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Plastic-laminate-faced architectural cabinets.

1.3 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. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

C. ANSI A208.1 - American National Standard for Particleboard; 2022.

D. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

E. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. BHMA A156.9 - Cabinet Hardware; 2020.

H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

J. PS 1 - Structural Plywood; 2023.

K. PS 20 - American Softwood Lumber Standard; 2021.

L. Plywood Product Standards: Comply with PS 1 (ANSI A199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard PRP-108 for type of panel indicated.

M. AWI – Quality Standards.F

N. ED MMM-A-130 – Adhesive, Contact.

O. ISO 4586 – High Pressure Decorative Laminates (HPL, HPDL) Sheets Based on Thermosetting Resins (Usually Called Laminates).

P. FSC – Forestry Stewardship Council.

Q. SFI – Sustainable Forestry Initiative.

R. AMTF – American Tree Farm System.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Exposed Portions of Casework.
   2. Semi-Exposed Portions of Casework.
   3. Concealed Portions of Casework.

1.6 ACTION SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data: For each type of product indicated including cabinet hardware and accessories and finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork
   4. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated, not limited to standard range of colors and textures:
   1. Plastic laminates.
   2. ABS/PVC edge material.

E. Samples for verification of the following:
   1. Corner pieces as follows:
      a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   2. Exposed cabinet hardware, one unit for each type and finish. Include all required accessories such as spacers brackets, sleeves, etc. necessary for complete installation and applicable cut sheets for all items.
   3. Submit one (1) full scale sample base cabinet representative of construction, finish and hardware specified, unless specifically waived by the Architect

F. Manufacturers: Submit manufacturer's documentation substantiating the requirements for each type of materials as indicated:
   1. Provide Letter of Certification(s) for Sustainable Forestry from one of the following:
   2. Forestry Stewardship Council – (FSC)
   3. Sustainable Forestry Initiative – (SFI)
   4. American Tree Farm System – (AMTF)
   5. Provide letter of certification signed by lumber supplier. Indicating compliance with organization requirements and identify certifying organization.
   6. Submit organization certification numbers; identify each certified product on a line-item basis.
   7. Submit copies of invoices bearing the organization certification numbers.

G. Manufacturers: Submit manufacturer's documentation substantiating the requirements for each type of materials as indicated:
   1. Provide Letter of Certification(s) for Sustainable Forestry.
   2. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC “Principles for Natural Forest Management” and identify certifying organization.
   3. Submit FSC certification numbers; identify each certified product on a line-item basis.
   4. Submit copies of invoices bearing the FSC certification numbers.

H. Manufacturer’s fully assembled cabinet must be GREENGUARD GOLD certified.

I. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

J. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work. Fabricator shall have at least five (5) years experience in fabrication of similar quality cabinetwork.

B. Installer Qualifications: Employ only experienced Installers skilled in the successful installation of the specified materials and assemblies on similar projects for a minimum of five (5) years and are certified participant in AWI's Quality Certification Program.

C. Source Limitations: Provide products of the same manufacturer for all cabinets.
   1. Contractor shall be a member of AWI and compliance with the AWI Quality Certification Program is required.

D. Fire Hazard Classification: Comply with required NFPA, ANSI, and UL surface burning characteristics for plastic laminates, lumber, and plywood.

E. Quality Standard: Except as otherwise indicated, comply with the following standard:.
   1. Provide AWS Certificate with shop drawings indicating that the woodwork complies with the requirements of the grades specified.
      a. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
   2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.
   3. Custom cabinetwork shall be high pressure plastic laminate on plywood AWI Custom Grade, unless otherwise noted.
   4. Contractor shall field verify all necessary dimensions prior to fabrication of cabinetwork to assure proper fit.

F. The following performance details are project requirements and must be met by all Bidders whether named herein, or approved by Addendum, regardless of that Manufacturer's "Standards". Deviations will not be allowed.
   1. ADA, Americans with Disabilities Act Requirements: The special requirements specified herein shall be met, where specifically indicated on architectural plans as "ADA", or by General Note. Shall be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations.
   2. Lamination System: Doors, finished end panels, and other decorative exterior laminate surfaces shall be laminated exterior with .030-inch high-pressure plastic laminate, and interior with .020-inch high-pressure cabinet-liner. Lamination with hybrid P.V.A. Type III water resistant adhesives.
   3. Structural Cabinet Body: Cabinet backs shall be minimum 1/2 inch thick, inset from rear of body, and fully bound (dadoed) four sides. Provide 3/4-inch thick stiffeners fastened to

back/ body as specified herein. Back perimeter shall be toenailed with 16-gauge twin-pin coated mechanical fasteners for tight interior fit, and direct connection of back panel to body.

4. Interior Structure: All cabinets over 36 inches wide shall be furnished with a mechanically fastened, yet removable, vertical divider to reduce horizontal member/ shelf deflection. Wall cabinets shall have a clear inside nominal depth of 12 inches unless detailed otherwise.
5. Shelf Loading: Shelves shall meet the loading/deflection standards of the National Particleboard Association.
6. Structural Drawer Body: Drawer body shall be doweled with 1/2 inch typical bottom, recessed, fully bound (dadoed) and joint-glued all four sides. Provide under body stiffeners as specified herein.
7. Drawer Suspension: Drawer slides shall be self-closing design, epoxy power coated, with positive instop, outstop, and out-keeper. Dynamic (operational) load rating shall be minimum 100 lbs.. Minimum 150 lbs. static load rating.
8. Structural Cabinet Support: Cabinet sub-base shall be of a separate and continuous ladder-type platform design leveled and floor mounted prior to cabinets body placement. Material shall be exterior grade plywood. No cabinet sides-to-floor will be allowed.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Shelf Clips: Furnish 150 shelf clips for the Owners future use.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

C. Repair or replace any item damaged during delivery or installation at no additional cost

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. All cabinets shall be manufactured in a climate-controlled environment, stored after fabrication in a climate controlled (temperature and humidity) storage area and shipped to the jobsite in an enclosed container (semi-tractor trailer).

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
   2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.
   3. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

D. Coordinate work with plumbing, mechanical, electrical, and other trades for rough-in work and installation of adjacent and associated components.

E. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed and indicate measurements on Shop Drawings.

F. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

1.12 WARRANTY

A. Cabinet Manufacturer shall warrant all casework products against manufacturing defects in materials and workmanship for a period of five (5) years.

B. Manufacturer shall warrant against structural failure of the cabinet body for a period of ten (10) years.

C. Installers Warranty: The installer shall warrant the entire installation against defects in material and workmanship for a period of one (1) year.

D. Duration of all warranties shall begin on the date of Substantial Completion.

E. Products will be repaired or replaced by Manufacturer, without cost to the Owner.

1.13 PERFORMANCE

A. Manufacturers shall have independently tested their products and be able to submit documentation of results indicating compliance with AWI Performance Duty Level 3 as a minimum for structural performance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be as indicated on the drawings. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Wilsonart.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Abet Laminati Inc.
   2. Formica Corporation.
   3. Laminart.
   4. Nevamar Corp.
   5. Pioneer Plastics Corp.
   6. Westinghouse Electric Corp.; Specialty Products Div.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
   1. Hardboard: AHA A135.4, smooth both sides. Use for drawer bottoms, vertical dividers and dust panels below drawers.
   2. Medium-Density Fiberboard: ANSI A208.2 and NPA 4-73. Use for unexposed cabinet backs, drawer sides, subfronts and backs.
   3. Particleboard: ANSI A208.1, Grade I-M-3 or higher quality. Use 47 # density for doors.
   4. Softwood Plywood: PS 1.

5. Plywood at Receiving Area: Hardwood plywood “Veneer Core” Grade AA, with no-added-Urea Formaldehyde adhesives. All casework in the plant manager and receiving area shall be plywood construction.
   a. Use 3/4" thick, closed-grain hardwood plywood typical unless noted otherwise.
6. Marine Grade Plywood: 3/4" specially designed panel made entirely of Douglas-fir or Western Larch. The grade of all plies of veneer is B or better. Exposure rating is EXTERIOR and the glue used is a fully waterproof structural adhesive. Provide Marine Grade plywood at all cabinets with sink units.

B. High-Pressure Decorative Laminate: NEMA LD 3, and conform to FS LP 508H, grades as indicated, or if not indicated, as required by woodwork quality standard.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following thickness requirements:
   1. Horizontal surfaces shall be Grade HGS, minimum 0.050” thick.
   2. Vertical surfaces shall be Grade VGS, minimum 0.028” thick.
   3. Post-formed surfaces shall be Grade HGP, minimum 0.039” thick.
   4. Cabinet liner shall be minimum 0.020” thick white.
   5. Balance sheets for countertops shall be Grade HGS, minimum 0.50” thick, Grade 72.

D. Edges: ABS/PVC extruded fabrication.

E. Adhesive for Bonding Plastic Laminate: Contact cement.
   1. Shall conform to AWI-100 –S-5, AWI-200-6-11, and meet NAPF Spec. Q SI – 1008.

F. Interior Exposed Hardwood and AWI – 100- S – 1: Red Oak, plain sliced, premium grade, Grade 1 for transparent finish; white pine, pline sliced, custom grade, Grade 2 for paint finish. Interior Unexposed framing & AWI – 100 – S – 1: Soft wood, economy grade.

G. Fasteners shall be of type, size and strength suitable to application. Fasteners shall be corrosion-resistant where subject to moist or humid conditions. Fasteners which cannot be concealed shall be chrome-plated with smooth heads. Comply with FS FF-S-111 for screws and FS FF-N-105 for nails.

H. Filler shall be white lead paste, Fed. Spec. TT-W-00251, Type B. Verify compatibility with adhesive prior to use.

I. Sealant shall be Fed. Spec. TT-S-00230 or TT-S-00227, Type I or II to suite job condition. Sealant shall be color matched to laminate colors or as otherwise directed by Architect.

2.3 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
   2. Satin Stainless Steel, Stainless-Steel Base: BHMA 630.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

F. Locks are required on all cabinets, keyed alike.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
   1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
   1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

D. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

E. Construct custom cabinetwork in conformance to details on Drawings approved shop drawings, and AWI Quality Standards. Coordinate installation of all hardware to provide proper cut-out.

F. Fabrication dimensions shall be based on field dimensions to assure proper fit.

G. All discrepancies or conflicts should be brought to the attention of the Architect prior to fabrication.

2.6 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Basis of Design Product: "Woodgrains" High-Pressure Decorative Laminate.

B. Pattern Direction:
   1. Vertically for drawer fronts, doors, and fixed panels.

C. Edges: ABS/PVC extruded fabrication.

D. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets. All edges, cuts and openings shall receive plastic laminate, cabinet liner or primer sealing material to prevent moisture absorption and formaldehyde emissions.
   1. Joinery shall be dado and glued or doweled and glued. Nails, staples or screws are not permitted in cabinet construction.

E. AWI Premium Grade, Type of Cabinet Construction: Flush overlay.

F. Laminate thicknesses for Semi-exposed Surfaces:
   1. Surfaces Other than Drawer Bodies:
      a. NEMA LD 3, Grade VGS, thickness .028" (0.7 mm).
   2. Cabinet Liner Standard: NEMA LD 3, Grade CLS, thickness .020" (0.51 mm).

G. Colors for base and overhead cabinet's to be selected from manufacturers standard color line. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:
   1. Solid colors.
   2. Patterns.

2.7 CLOTHES SHELVING AND CLOTHES ROD

A. Closet Shelving: Made from the following material, 3/4 inch (19.05 mm) thick.
   1. Shelf: Material with edge type indicated.
   2. Shelf Cleats: 3/4-by-3-1/2-inch boards.
   3. Brackets: Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.

B. Clothes Rod
   1. Clothes Rods: 1-5/16-inch chrome-plated-steel tubes.
   2. Rod Flanges: Chrome-plated steel.

2.8 DETAILED REQUIREMENTS FOR CABINET CONSTRUCTION

A. General:
   1. Cabinet Sub-base: To be separate and continuous (no cabinet body sides to floor), pressure treated 2 x 4 or pressure treated plywood with concealed fastening to cabinet bottom. Ladder type construction, of front, back and intermediates, to form a secure and level platform to which cabinets attach.

B. Cabinet Top and Bottom: Wall and Base:
   1. At sink locations, base cabinet box to be exterior grade plywood, sides, front, rear and bottom with finish materials as specified.
   2. Base cabinet bottoms to be putty, light beige, dove grey or white colored polyester laminated particle board interior side, 3/4" thick phenolic neutral colored backer sheet on a concealed side.
   3. Solid sub-top to be 3/4" and furnished for all base cabinets.
   4. Wall cabinet and library stack bottoms and tops shall be 3/4" thick where less than 36" wide and 1" where greater than 36" wide.
   5. Exterior underside of exposed wall cabinet bottoms to be polyester laminate. Assembly devices to be concealed on bottom side of wall cabinets.

C. Cabinet Tops – Wall and Tall Cabinets:
   1. Tops to be covered with polyester laminate.

D. Cabinet Ends:
   1. Putty, light beige, dove grey, or white colored polyester laminated particle board interior side 3/4" thick with phenolic neutral colored back sheet on concealed side. Holes drilled for adjustable shelves 1 1/4" on center.
   2. Exposed exterior cabinet ends and edges to be laminated with 0.028" thick plastic laminate.
   3. Semi-exposed interior surfaces to be laminated with 0.020" thick, white, plastic laminate.
   4. Where vertical panels exceed 36" dimension, utilize 1" thick particleboard cores; Panels 48" – 60", utilize 1 1/4" thick particleboard cores; where panels exceed 60" dimensions, utilize 1 1/2" thick particleboard cores.
   5. At base or wall cabinets in a fixed line, each pair of cabinet doors to be opposite hinged so strike meets at the middle stile.

E. Fixed and Adjustable Shelves:
   1. Putty, light beige, dove grey, or white colored polyester laminated particle board two sides. Leading exposed edge of shelves to be edged with 1mm FlatEdge PVC, putty, black or grey in color.
   2. Thickness: standard shelving to be 3/4" thick. Provide 1" thick shelving where 36" wide and over.
   3. Shelves shall not be unsupported for more than 48" span.
   4. Shelves shown as having plastic laminate on all six sides shall be laminated as such.
   5. Shelves not shown to have laminate on all six sides shall have laminate on top, bottom and front edge. Side and back edge shall be sealed to prevent moisture absorption and formaldehyde emissions.

F. Cabinet Backs:
   1. Standard cabinet back to be 3/8" thick let in on at least 3 sides, prefinished putty, light beige, dove grey or white for use on all cabinets with or without doors. Rear, unexposed, side of back to receive continuous hot melt glue at joint between back and sides/top/bottom/ for sealing against moisture and vermin, and further contribute to case rigidity, or 1/4" stapled onset hardboard, or 1/2" stapled and screwed onset particle board.
   2. Unexposed cabinet backs shall receive cabinet liner and be let into sides, top frame and bottoms.
   3. Laminate thickness, NEMA LD 3, Grade BKL.
   4. Rear, unexposed, side of back to receive continuous hot melt glue at joint between back and sides/top/bottom/ for sealing against moisture and vermin, and further contribute to case rigidity, or 1/4" stapled onset hardboard, or 1/2" stapled and screwed onset particle board.
   5. Unexposed cabinet backs shall receive cabinet liner and be let into sides, top frame and bottoms.
   6. Exposed edges to be 3mm thick PVC, color as selected by Architect. Corners to be machine-radiused and buffed to a consistent 3mm radius.
   7. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3. Provide Grade VGS or Grade CLS.
   8. Stile and Rail doors to be 13/16" thick plastic laminated door with 1/4" plate glass. Available hinged or sliding. All exposed lite-opening edges to be trimmed and glazed with extruded vinyl glazing bead.
   9. Sliding glass doors to be 1/4" thick tempered plate glass with ground and polished edges. Fitted with etched and anodized aluminum shoes and nylon rollers.
   10. Provide door stops/holders where necessary to prevent door from opening into adjacent cabinets, mirrors, etc.
   11. Exposed cabinet backs shall be 3/4" thick plywood with 0.028" thick plastic laminate on exterior and exposed surfaces and white, 0.20" thick plastic cabinet liner on interior surface.

G. Drawers:
   1. Drawer Sides and Backs:
      a. Solid hardwood lumber, shop finished.
      b. Drawer sides shall be dadoed or rabbeted to receive front and back, machine squared and held under pressure while glued and pinned together.
      c. Sides and back of drawers to be 1/2" thick putty, light beige, dove grey or white colored fiberboard; sub-front same, to be 5/8" thick. Surfaces shall receive white cabinet liner on all surfaces.
   2. Drawer fronts shall be applied to separate drawer body component sub-front.
   3. Fiberboard to be of uniform density and meet the following minimum standards:
      Screw Holding Face…….320 lbs.
      Screw Holding Edge…….230 lbs

Modulus of Rupture……...4,500 psi
Modulus of Elasticity…….500,000 psi
Internal Bond……100 psi

4. Paper storage drawers fitted with hood at back.
5. All drawers shall have roller guides as specified.
6. Surfaces shall receive white cabinet liner on all surfaces.
7. Drawer bottom:
   a. Polyester laminate, 1/4” thick tempered hardboard, housed and glued into front, sides and back with underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity, or ½” thick prefinished particleboard with color to be putty, light beige, dove grey, or white screwed directly to the bottom edges of the drawer box.
   b. At file drawers having recessed compressor tracks, utilize two (2) layers for drawer bottoms.
   c. Reinforce drawer bottom as required with intermediate spreaders.

H. Door / Drawer Spreaders:
   1. Provide 1” x 2” minimum x full width putty, light beige, dove grey or white finished cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, and close off reveal.

I. Vertical and Horizontal Dividers:
   1. Tempered hardboard 1/4” thick, smooth both faces. Secured in cabinet with molded plastic clips.
   2. Putty, light beige, dove grey or white colored polyester laminated particle board 3/4” thickness.
   3. Secured in cabinet with molded plastic clips or dowels.
   4. Front edge to be 1 mm FlatEdge PVC.

J. Adjustable standards shall be recessed flush into side panels of adjustable shelves. Attachment hardware shall match finish of standards. Option: Utilize 32 mm hole spacing with metal pin shelf clips as specified.

K. Cabinet Doors:
   1. Doors shall have a minimum of two (2) hinges per door to a height of 36”. Doors from 36” to 64” shall have a minimum of three (3) hinges per door. Doors greater than 64” shall have a minimum of four (4) hinges per door.
   2. All cabinet doors shall have a minimum of two (2) silencers per door. Drawers shall have either a drawer slide with an integral silencer device, or two (2) silencers per drawer, one (1) on each side near top edge of drawer.

L. Provide laminate clad dust panels of 1/4” medium density fiberboard or tempered hardboard between and below drawers.

M. Plastic laminated as specified shall cover all exposed and semi-exposed surfaces and as otherwise specified, including upper side of toe spaces, reveals, tops, etc. Do not install plastic laminate when another finish is scheduled, such as base material in toe space vertical surface. Verify all such conditions prior to fabrication.

N. Millwork: Treat base of all millwork with Borax.

2.9 ENVIRONMENTAL

A. Products: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC “Principles for Natural Forest Management” and identify certifying organization.

C. Certification: Submit FSC certification numbers, identify each certified product on a line-item basis.

D. Ureaformaldehyde: No ureaformaldehyde products shall be added or allowed in any products.

E. Adhesives: For adhesives, including printed statement of VOC content.

F. Composite Wood: For composite-wood products, documentation indicating that product contains no urea formaldehyde.

G. Recycled Content: Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 20 percent.

H. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
   1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

I. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Contact Adhesive: 250 g/L.

J. Submit manufacturer’s certification that products comply with VOC limits when calculated according to 40CFR 59, Subpart D (EPA Method 24).

K. Submit manufacturer's product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

L. Submit Green Seal Certification to GS-36 and description of the basis of certification.

M. Submit manufacturer's certification that products comply with SCAQMD #1168. Submit manufacturer's certification that products comply with SCAQMD Rule 1168 in areas where exposure to freeze/thaw conditions and direct exposure to moisture will not occur. In areas where freeze/thaw conditions do exist or direct exposure to moisture can occur, submit manufacturer's certification that products comply with Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz. with California Air Resources Board (CARB) for containers 16 oz. or less.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of institutional casework.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.3 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

C. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops).

D. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts. Backsplash shall be scribed accurately to wall and sealed continuously.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Shelves supporting microwaves, and vertical supports, shall be deep enough to accommodate microwave overhang and power cord.

H. Seal joints between cabinets and wall, and at penetrations through cabinets such as piping, conduit, etc.

I. Install cylinder locks on all cabinetwork and secure locks tightly into place allowing for smooth operation.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces.

D. Remove all cartons, debris, sawdust, scraps, etc., and leave spaces clean and cabinets ready for Owner’s use.

E. Protect all cabinetwork prior to, during, and after installation to prevent damage. Repair or replace damaged units at no additional cost.

F. Clean all adhesive, dirt, dust, etc. from all cabinetwork just prior to acceptance.

3.5 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.6 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

B. Manufacturer: Subject to compliance with requirements, provide cabinet from one of the following:

C. Door Hinges – Concealed hinges (European type) BHMA A156.9, B01602, 135-degrees of opening.

D. Door and Drawer Pulls – Back-mounted, solid metal with brushed chrome finish, 4" long by 5/16" diameter. Style No. 4484 as manufactured by Stanley.

E. Door Silencers – Clear polyurethane with convex surface:

1. Blum - TP1950.
2. Hafele - 356.21.428.
3. Hettich - 58 020 121.

F. Door Catch: At double doors provide cast aluminum, Ives #2 Elbow Catch at inactive leaf. Pull Chain catches not permitted. At Wardrobe cabinets provide fixed shelf at center of unit for catch mounting.

G. Door and Drawer Locks: Key alike within each room key all locks to be General Master Key System: Verify with Architect. All doors and drawers to be provided with locks.
1. Door Locks: BHMA A156.11, E07121, 5-disc tumbler locks, provide National Lock No. C8060.
2. Drawer Locks: BHMA A156.11, E07041, lock in each room shall be keyed alike.

H. File Drawer Slides – Grade 1HD-100 for drawers not more than 6" high or 24" wide. Grade 1HD-200 for drawers more than 6" high or 24" wide.

I. Drawer Slides – BHMA A156.9, B05091, heavy duty (Grade 1HD-100 and Grade 1HD-200) side mounted, full extension type, zinc-plated steel ball-bearing slides.

J. Pencil Drawer Slides – Grade 1 for drawers not more than 3" high and 24" wide.

K. Keyboard Slides – Grade 1HD-100

L. Adjustable Wall Mounted Standards and Supports
1. Knape and Vogt No. 87 heavy duty 12-gauge steel, anochrome finish. Shelf bracket Knape and Vogt No. 187LL extra heavy-duty shelf brackets, 12"

M. Adjustable Shelf Supports: Injection molded polycarbonate (clear color), friction fit into cabinet and panels and vertical dividers, adjustable on 1 1/4" centers. Each shelf support with two (2) integral supports pins, 5 mm diameter, to interface pre-drilled holes and prevent accidental rotation of support. Supports automatically adaptable to 3/4" or 1" thick shelving and provide non-tip feature for shelving. Supports are designed to readily permit field fixing of shelf if desired. In lieu of above, provide 1/4" diameter holes at 1 1/4" o.c. vertically to receive Hafele Type “H” nickel-plated shelf clamp supports (four per shelf). Shelving 3-feet wide or wider shall be 1-inch thick.

N. File Drawer Compressor:
1. Knape and Vogt 476, track recessed in drawer bottom. Provide additional layer of drawer bottom material to recess track.

O. Wardrobe Coat Rod:
1. Knape and Vogt 770-5 CHR, with 764 CHR end brackets at standard wardrobe cabinets; 770-1 CHR and 760 and 732 NP at shallow wardrobe cabinet.
2. Hettich 51 010 077 with SL 332 D, 51 016 880 (or SL 323 D, 51 016 881, if preferred); SL 778, 51 015 991 at shallow wardrobe.

P. Wall Hung Open Shelves:
1. Knape and Vogt Heavy-Duty Standards - 87 ANO – 10".
2. Knape and Vogt Extra Heavy-Duty Brackets - 187LL – 12".
3. Knape and Vogt Shelf Rests - 210 ANO and 212 ANO.

Q. Door Catches: Provide heavy duty, spring loaded, large 11/16" diameter roller mounted catch at bottom edge of door. All doors over 48" in height shall have top and bottom catches. At double doors provide cast aluminum “Ives #2 Elbow Catch” at inactive leaf. Pull chains not permitted. At wardrobe cabinets provide fixed shelf at center of unit for catch mounting.

R. Sliding Glass Door:
1. K & V Door: # P1092 anodized FZY Roll Aluminum Track Assembly.

S. Lock Sliding Glass Door:
1. K & V #965NP.

T. Molded Trays:
   1. High impact polyethylen with card holders, Putty finish.
   2. Sizes: 10-1/2” W x 3-1/2” H x 19 and 14-1/2” W x 3-1/2” H x 19.
   3. Trays shall glide on structural polyethylene continuous side rails, adjustable 1” on center. Putty finish.

U. Grommets for Cable Passage Through Countertops: 2" o.d. black molded plastic with matching caps with slot for wire passage “OG Series” as manufactured by Doug Mockett & Company, Inc. or approved equal.

V. Provide additional accessories as required for complete installation of all hardware.

W. Exposed Hardware Finish: Satin chromium plated; BHMA 626 for brass or bronze base, BHMA 652 for steel base.

END OF SECTION

SECTION 06 60 00 - CELLULAR PVC FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Cellular PVC fabrications including the following:
   1. Mouldings.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. 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.

B. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (152.4 mm) square representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

B. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.

C. Installer Qualifications: Minimum 2 years experience installing similar products.

D. Mock-Ups: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Construct area designated by Architect.
   2. Do not proceed with remaining work until workmanship is accepted by Architect.
   3. Remodel mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Comply with manufacturer's recommendations. Handle materials to avoid damage.

1.8 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 recommended limits.

1.9 WARRANTY

A. Provide manufacturer's standard limited warranty for products, stating that components will be free from defects in material that occur as a direct result of the manufacturing process, occur

under normal use and service, occur during the warranty period and result in blistering, peeling, flaking, cracking, splitting, cupping, rotting or structural defects from termites or fungal decay.

1. Moulding Warranty Period: 25 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. AZEK Building Products, Inc.; https://www.azek.com;https://timbertech.com

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 MOULDINGS

A. Crown Profiles: Material shall have the following characteristics:
   1. Material: Solid Cellular PVC.
   2. Crown Moulding Profile: See Drawings.

B. Detail Profiles: Material shall have the following characteristics:
   1. Material: Solid Cellular PVC.
   2. Detail Profile: See Drawings.

C. Casing Profiles: Material shall have the following characteristics:
   1. Material: Solid Cellular PVC.
   2. Casing Profile: See Drawings.

2.3 ACCESSORIES

A. Fasteners: Stainless steel or hot-dip galvanized, with thin shank, blunt point, full round head as recommended by the manufacturer.

B. Adhesives: AZEK Adhesive, a non-toxic, odorless, UV stable, water-based PVC cement.

C. Sealants: Urethane, polyurethane or acrylic based sealants without silicone.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions that may be detrimental to proper or timely completion.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install products in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
   1. Use manufacturer's recommended fasteners, not more than 2 inches (50.8 mm) from ends.
   2. Glue joints to eliminate joint separation.
   3. Allow for expansion and contraction at ends of the runs.

3.3 CLEANING AND PROTECTION

A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.

B. Clean products, prior to Substantial Completion, using materials recommended by the manufacturer to remove stains, dirt and debris prior to final acceptance.

END OF SECTION

This page intentionally left blank

SECTION 07 21 00 - THERMAL INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Requirements including but not limited to:
   1. Extruded polystyrene foam plastic board.
   2. Polyisocyanurate foam plastic board.
   3. Glass mineral fiber blanket.
   4. Accessories necessary for a complete installation.

1.3 REFERENCE STANDARDS

A. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations; 2018.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

G. ASTM C727 - Standard Practice for Installation and Use of Reflective Insulation in Building Constructions; 2019.

H. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2025.

I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

J. ASTM C1104/C1104M - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation; 2019.

K. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2021.

L. ASTM C1320 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction; 2020.

M. ASTM C1321 - Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction; 2015.

N. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

O. ASTM C1744 - Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Commercial/Industrial Building Construction; 2019.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

Q. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

R. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

S. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Technical data and installation instructions for each type of insulation product specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Exterior Product Approvals: Manufacturer shall submit documentation that product complies with large and small missile impact criteria and has been tested and approved in compliance with Florida Product Approval or Miami Dade NOA and applicable requirements.

E. Manufacturer's Installation Instructions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Fire Performance Characteristics: Identify products with appropriate markings of applicable testing and inspecting organization
      a. Surface Burning Characteristics: Per ASTM E84.
         1) Flame Spread Index: Maximum 25.
         2) Smoke Developed Index: Maximum 450.
      b. Fire Resistance Ratings: Per ASTM E119.
      c. Combustion Characteristics: Non-combustable per ASTM E136.
   2. Underwriter's Laboratories UL 723 Tests for Surface Burning Characteristics of Building Materials.

B. Single Source Responsibility for Insulation Products: Obtain each type of building insulation from single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of work.
   1. Mark insulation boards and packages with manufacturer's name and product designation. Unmarked boards and packages will be rejected.

C. Environmental Requirements:
   1. Manufacture extruded polystyrene with HCFC or other CFC free blowing agents.
   2. Insulations shall not contain formaldehyde, asbestos, lead, mercury, mercury compounds, or polybrominated diphenyl ether fire retardants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam plastic board insulation:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

1.8 PROJECT CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

B. Sequence work to ensure fireproofing and firestop materials are in place before beginning work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. CertainTeed Corporation: www.certainteed.com/building-insulation.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. DuPont de Nemours, Inc.: www.dupont.com.
   2. Hunter Panels: www.hunterpanels.com.
   3. Johns Manville; a Berkshire Hathaway company
   4. Kingspan Group:www.kingspan.com/us/en.
   5. Knauf Insulation: www.knaufinsulation.com.
   6. Owens Corning: www.owenscorning.com/en-us/insulation/commercial.
   7. Rmax, a subsidiary of the Sika Corporation: www.rmax.com.
   8. Rockwool A/S: www.rockwool.com/north-america.

2.2 EXTRUDED POLYSTRENE FOAM BOARD

A. Extruded Polystrene Foam Board: ASTM C578, Type IV.
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. Styrofoam Cavitymate Plus manufactured by DuPont de Nemours, Inc.
      b. GreenGuard manufactured by Kingspan Group.
      c. Foamular CW25 manufactured by Owens Corning.

2.3 POLYISOCYANURATE FOAM PLASTIC BOARD

A. Subject to compliance with the requirements of this Section, provide one of the following:
   1. Thermax manufactured by DuPont de Nemours, Inc.
   2. Xci manufactured by Hunter Panels.
   3. ECOMAXci manufactured by Rmax, Inc.

B. Fire Propagation Characteristics: Pass NFPA 285 testing as part of an approved assembly.

2.4 GLASS MINERAL FIBER INSULATION

A. Glass Mineral Fiber Batt, Unfaced: ASTM C665, Type I (unfaced); with maximum flame spread and smoke developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. CertaPro manufactured by CertainTeed Corporation.
      b. Guardian Building Products, Inc. (Bought by Knauf)
      c. Johns Manville; a Berkshire Hathaway company.
      d. EcoBatt with ECOSE manufactured by Knauf Insulation.
      e. PINK Next Gen Fiberglas manufactured by Owens Corning.

B. Glass Mineral Fiber Batt, Kraft Faced: ASTM C665 , Type II (nonreflective faced), Class A (faced surface with a flame spread index of 25 or less); Category 1 (membrane is a vapor barrier).
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. CertainTeed Corporation.
      b. Johns Manville; a Berkshire Hathaway company.
      c. EcoBatt with ECOSE manufactured by Knauf Insulation.
      d. PINK Next Gen Fiberglas manufactured by Owens Corning.

C. Glass Mineral Fiber Board:
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. CertainTeed Corporation.
      b. Johns Manville; a Berkshire Hathaway company.
      c. Earthwool manufactured by Knauf Insulation.
      d. Fiberglas 700 Series Board manufactured by Owens Corning.
   2. Fire Performance:
      a. Combustibility: Non-combustible per ASTM E136.
      b. Surface Burning Characteristics: Per ASTM E84.
         1) Flame Spread: 0.
         2) Smoke Developed: 0.
   3. Thermal Resistance:
      a. 2” and less R value/1 inch at 75 ºF: 4.2 h ft2 ºF/Btu per ASTM C518.
      b. 2” and greater R value/1 inch at 75 ºF: 4.3 h ft2 ºF/Btu per ASTM C518.
   4. Water Vapor Permeance: 27.2 Perm minimum.
   5. Moisture Absorption: 1% maximum per ASTM C1104/C1104M.
   6. Fungi Resistance: Zero mold growth per ASTM C1338.
   7. Corrosive Resistance:
      a. Steel per ASTM C665: Pass.
      b. Stainless Steel per ASTM C795: Pass.

2.5 ROCK MINERAL FIBER INSULATION

A. Rock Mineral Fiber Blanket: ASTM C665, Type I, complying with ASTM E136 smoke developed and flame spread of 0.
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. Thermafiber UltraBatt. manufactured by Owens Corning.
      b. ComfortBatt manufactured by Rockwool A/S.
   2. Fire Performance:
      a. Combustibility: Non-combustible per ASTM E136.
      b. Surface Burning Characteristics: Per ASTM E84.
         1) Flame Spread: 0.
         2) Smoke developed: 0.
   3. Thermal Resistance: To ASTM C518.
   4. Density: 2 lbs/ft3 to ASTM C167.

B. Rock Mineral Fiber Board: ASTM C612, Type IVB.
   1. Subject to compliance with the requirements of this Section, provide one of the following:
      a. Thermafiber manufactued by Owens Corning.
      b. CavityRock manufactued by Rockwool A/S.
   2. Fire Performance:
      a. Combustibility: Non-combustible per ASTM E136.
      b. Surface Burning Characteristics: Per ASTM E84.
         1) Flame Spread: 0.
         2) Smoke Developed: 0.

3. Thermal Resistance:
   a. 2” and less R value/1 inch at 75 ºF: 4.2 h ft2 ºF/Btu per ASTM C518.
   b. 2” and greater R value/1 inch at 75 ºF: 4.3 h ft2 ºF/Btu per ASTM C518.
4. Water Vapor Permeance: 27.2 Perm minimum
5. Moisture Absorption: 1% maximum per ASTM C1104/C1104M.
6. Fungi Resistance: Zero mould growth per ASTM C1338.
7. Corrosive Resistance:
   a. Steel per ASTM C665: Pass.
   b. Stainless Steel per ASTM C795: Pass.

2.6 INSULATION FASTENERS

A. Adhesively Attached, Spindle Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
   1. Plate: Perforated, galvanized carbon steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
   2. Spindle: Copper coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle Shaped, Spindle Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
   1. Angle: Formed from 0.030 inch (0.762 mm) thick, perforated, galvanized carbon steel sheet with each leg 2 inches (50 mm) square.
   2. Spindle: Copper coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

C. Insulation Retaining Washers: Self-locking washers formed from 0.016 inch (0.41 mm) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
   1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
      a. Crawl spaces.
      b. Ceiling plenums.
      c. Attic spaces.

D. Insulation Standoff: Spacer fabricated from galvanized mild steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch (25 mm) between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.7 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame spread and smoke developed indexes of 5, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Board Insulation: Install insulation that is undamaged, dry, and unsoiled and has not been exposed to ice, rain, or snow at any time.
   1. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Do not seal joints in board insulation. Remove projections that interfere with placement.
   2. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

C. Board and Batt Insulation: Install insulation that is undamaged, dry, and unsoiled and has not been exposed to ice, rain, or snow at any time.
   1. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Do not seal joints in board insulation. Remove projections that interfere with placement.
   2. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

D. Cavity Wall Insulation: Foam Plastic Board Insulation: Install pads of adhesive spaced approximately 2 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
   1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for attachment to masonry walls.
   2. Cellular Glass Board Insulation: Install with closely fitting joints using attachment method according to manufacturer's written instructions.

E. Framed Construction, Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3 inch (76 mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For metal framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   6. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
      a. Glass Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
      b. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

F. Curtain Wall: Install board insulation in curtain wall construction according to curtain wall manufacturer's written instructions.
   1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
   2. Install insulation to fit snugly without bowing.

G. Reflective Insulation: Install sheet reflective insulation according to ASTM C727.
   1. Install sheet radiant barriers according to ASTM C1744.
   2. Install interior radiation control coating system according to ASTM C1321.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

This page intentionally left blank

SECTION 07 26 00 - VAPOR RETARDER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Vapor retarder for building concrete slabs on grade.

1.3 REFERENCE STANDARDS

A. 2017 ASHRAE Fundamentals Handbook: CHAPTER 25

B. ASTM C920 – Standard Specification for Elastomeric Joint Sealant

C. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting

D. ASTM D1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method

E. ASTM E96 – Test Methods for Water Vapor Transmission of Materials

F. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

G. ASTM F1249 – Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

H. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

I. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

J. SWRI (Sealant, Waterproofing and Restoration Institute) – Sealant and Caulking Guide Specification

K. ACI 302.1R – Guide for Concrete Floor & Slab

L. ACI 302.2R – Guide for Concrete Slabs that Receive Moisture Sensitive Flooring Materials .

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

B. Provide the manufacturer’s installation instructions indicating preparation and installation requirements techniques per ASTM E 1643.

C. Independent laboratory test results showing compliance with ASTM & ACI Standards.

D. Manufacturer’s samples, literature.

E. Manufacturer’s installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.

F. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.

B. Maintain one copy of each document on site.

1.7 WARRANTY

A. Independent laboratory test results showing compliance with ASTM & ACI Standards.

B. Manufacturer's samples, literature.

C. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.

D. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

1.8 PERFORMANCE REQUIREMENTS

A. Water Vapor Transmission Rate: Maximum as indicated per ASTM E96 or ASTM F1249.

B. Minimum ASTM E1745 Class A rating for slabs on grade.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Stego Industries, LLC.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Moistop Ultra, Henry Company.
   2. Griffolyn, Reef Industries, Inc.

2.2 SHEET MATERIALS

A. Below Grade Sheet Vapor Barrier (Building slabs on grade) shall have the following properties:
   1. Permeance Rating of less than 0.01 Perms (grains/ft2 . hr . inHg) as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1 – 7.1.5).
   2. Water Vapor Retarder: Meet or exceed Class A per ASTM E1795.
   3. Thickness: 15 mils minimum.
   4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
   5. The manufacturer's name shall be printed on the material or documentation shall be provided attesting that the installed material complies with the product submitted and reviewed by the Architect.

B. Vapor Barrier Products:
   1. Basis of Design: "Stego Wrap Vapor Barrier"

2.3 ACCESSORIES

A. Thinner and Cleaner for Sheet: As recommended by sheet material manufacturer.

B. Sealant: As recommended by the sheet material manufacturer.

C. Adhesives: As recommended by sheet material manufacturer.

D. Tape shall be as required by manufacturer of the vapor retarder with a maximum water vapor transmission rate of .03 perms (ASTM E 96).

E. Perimeter Tape: Manufacturer's textured tape.

F. Termination Bar: Manufacturer’s termination bar.

G. Double-sided Tape: Manufacturer’s double-sided tape.

H. Mastic: Manufacturer’s mastic.

I. Pre-Cut Pipe Boot: Manufacturer’s pre-cut pipe boot.

J. Manufacturer’s Penetration Prevention System and Screed System.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to installing vapor barriers, inspect fill areas for sharp objects or other items that might puncture the material. Remove such objects before placing membrane.

B. Inspect installed vapor barriers and joint fillers for proper placement, levelness, etc. prior to placement of concrete. Patch all penetrations, tears, rips and joints in vapor barriers and adjust joint filler for proper height, location and material thickness.

3.2 PREPARATION

A. Remove loose or foreign matter that might impair adhesion.

B. Clean and prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Vapor barrier shall be installed in accordance with ASTM E1643 and per manufacturer's specifications, free of air pockets and wrinkles.

B. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

C. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.

1. Sealing to a slab: Seal vapor barrier to the entire slab perimeter using manufacturer’s textured tape with a surface that creates a mechanical seal to freshly-placed concrete, per manufacturer's instructions.
2. Sealing to a stem wall: Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer’s double-sided tape, or both termination bar and double-sided tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.

D. All laps shall be continuously sealed according to manufacturer's recommendations with a full adhesive bed at the seam or lap joints 6” and fully seal with tape. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.

E. Install joint filler of thickness shown on Plans, along all concrete slab on fill intersections with walls, columns, or other structural elements unless otherwise shown. Use 1/2" thickness unless otherwise noted. Hold material down approximately 1/4" below floor slab surface.

F. Seal all penetrations (including pipes) per manufacturer’s requirements with tape to restore barrier integrity.

G. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.

H. Repair any damaged areas by cutting patches of vapor retarder material, overlapping damaged area at least 6” into undamaged material and taping all sides.

I. Seal all joints after concrete has properly cured, flush with surface of concrete. Verify compatibility of sealant with any planned flooring adhesive, sealer, or other materials in contact with the sealant.

3.4 CLEANING

A. After installation, clean all surfaces and adjacent work area of excess material, waste, debris, etc.

END OF SECTION

SECTION 07 27 28 - FLUID-APPLIED MEMBRANE AIR BARRIER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Fluid-applied vapor permeable air barriers in wall cavities.

1.3 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 C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

D. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

E. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2021.

F. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).

G. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

H. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2018).

I. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

K. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems; 2017.

L. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

M. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2018.

N. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

O. ASTM D1938 – Test Method for Tear Propagation Resistance of Plastic Film and Sheeting.

P. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

Q. ASTM E96 – Test Methods for Water Vapor Transmission of Materials.

R. ASTM E154 – Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mock-ups.

C. Samples: Submit representative samples of the following for approval:
   1. Fluid-Applied membrane.
   2. Self-Adhered Transition Membrane.
   3. Self-Adhered Through Wall Flashing.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For air barrier manufacturer, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the air barrier, signed by product manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified.

1.7 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide products from a firm that makes the indicated products as a regular production item and has the capability of providing quantity of units so as not to delay the progress of work at Project site. with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Manufacturer’s Requirements: Manufacturer shall provide trained company personnel to attend necessary project meetings, perform periodic inspections, and conduct a final inspection upon completion of the Work.

1.8 WARRANTY

A. Submit a sample warranty identifying the terms and conditions.

1.9 MOCK-UP

A. Mock-ups: Build mockups to set quality standards for materials and execution.

B. Build integrated mock-ups of exterior wall assembly, 150 sq. ft. incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application and sealing of gaps, terminations, and penetrations of assembly.

C. Coordinate construction of mock-ups to permit inspection and testing of before external insulation and cladding are installed.

D. Include junction at building corner condition and foundation wall intersection.

E. If Architect determines mock-ups do not comply with requirements, reconstruct mock-ups and apply barrier until mock-ups are approved.

F. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.

G. Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRE-INSTALLATION MEETING

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

B. Review barrier requirements and installation, special details, mockups, air-leakage and bond testing, air and moisture barrier protection, and work scheduling that covers barriers.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions, recommendations, and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures, and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays but minimize on-site storage.

E. Remove and replace liquid materials that cannot be applied within their stated shelf life.

F. Protect stored materials from direct sunlight.

1.12 FIELD CONDITIONS

A. Environmental Limitations: Apply barrier within the range of ambient and substrate temperatures recommended by barrier manufacturer.
   1. Protect substrates from environmental conditions that affect barrier performance.
   2. Do not apply barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.13 WARRANTY

A. Submit manufacturer's warranty that barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

B. Warranty Period: Five (5) years from date of completion of the barrier membrane installation.

1.14 PERFORMANCE REQUIREMENTS

A. Barrier shall be capable of performing as a continuous vapor-permeable barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. GCP Applied Technologies

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Carlisle Coatings & Waterproofing, Inc.
   2. Tremco Incorporated, an RPM company

2.2 FLUID APPLIED BARRIERS

A. Basis of Design Product: “Perm-A-Barrier VPL 50RS”

B. Fluid-Applied Air Barrier Membrane: A fluid-applied, 20 mils (0.508 mm) thick vapor permeable, silyl terminated polyether (STPE) membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces.

C. Product shall meet the following requirements:
   1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/ft.2 under a pressure differential of 0.3 inch (7.62 mm). water 1.57 psf.
   2. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/ft.2 of surface area under a pressure differential of 0.3 inch (7.62 mm). water 1.57 psf when tested in accordance with ASTM E2357.
   3. Water Vapor Permeance: ASTM E96, Method B: Greater than 10 perms @ 20mil.
   4. Pull Adhesion: ASTM D4541: Minimum 30 psi (206.84 kPa) or substrate failure to glass faced wall board, minimum 50 psi (344.74 kPa) to concrete/CMU.
   5. Low Temperature Flexibility: ASTM D1970: Pass at minus 20 degrees Fahrenheit.
   6. Water resistance of in-place membrane: ASTM E331: Pass. No water penetration tested at 15 psf.
   7. Nail Sealability: ASTM D1970: Pass
   8. UV Exposure Limit: Minimum 180 calendar days
   9. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 ANCILLARY PRODUCTS

A. Transition Membrane: Manufacturer’s transition membrane consisting of a 0.04 inches (0.9 mm) of self-adhesive rubberized asphalt integrally bonded to 0 inch (0.1 mm) of cross-laminated, high-density polyethylene film to provide a min. 0.04 inch (1 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.
   2. Air Permeance at 0.3 inch (7.62 mm). water pressure difference: 0.0006 L/s. sq. m max.
   3. Puncture Resistance: ASTM E154: 40 lbs. min.
   4. Lap Adhesion at 25ºF: ASTM D1876: 5.0 lbs./in. of width
   5. Low Temperature Flexibility: ASTM D1970: Unaffected to -45ºF
   6. Tensile Strength: ASTM D412, Die C Modified: min. 2.7 MPa (400 psi (2757.90 kPa))
   7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

B. Flexible Membrane Wall Flashing: Manufacturer’s “Wall Flashing” consisting of a 0.03 inches (0.8 mm) of self-adhesive rubberized asphalt integrally bonded to 8 mil (0.2032 mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.016 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.
   2. Water Absorption: ASTM D570: max. 0.1% by weight.
   3. Puncture Resistance: ASTM E154: 80 lbs. min.
   4. Tear Resistance
      a. Initiation ASTM D1004: min. 13.0 lbs. M.D.
      b. Propagation ASTM D1938: min. 9.0 lbs. M.D.
   5. Lap Adhesion at 25ºF: ASTM D1876: 5.0 lbs./in. of width.

6. Low Temperature Flexibility: ASTM D1970: Unaffected to -45ºF
7. Tensile Strength: ASTM D412, Die C Modified: min. 800 psi (5515.81 kPa).
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

C. Flexible Membrane Aluminum Flashing: Manufacturer's "Aluminum Flashing" consisting of a 0.04 inches (0.9 mm) of self-adhesive rubberized asphalt integrally bonded to 0 inch (0.1 mm) of aluminum film to provide a min. 0.04 inch (1 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Absorption: ASTM D570: max 0.1% by weight.
   2. Puncture Resistance: ASTM E154: 80 lbs min.
   3. Lap Adhesion at 25ºF: ASTM D1876 Modified: 5.0 lbs./in. of width.
   4. Low Temperature Flexibility: ASTM D1970 Modified: Unaffected to -15ºF.
   5. Tensile Strength: ASTM D412, Die C Modified: min. 600 Psi.
   6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%.
      a. PERM-A-BARRIER® NPS Detail Membrane
      b. PERM-A-BARRIER® Liquid Flashing

D. Penetrations and Termination Sealant
   1. Manufacturer's S100 Sealant for Details, Final Terminations and Sheathing Joint Treatment: (ref: gcpat.com)

2.4 ACCESSORY MATERIALS

A. Substrate Patching Membrane: Bituthene Liquid Membrane, two- part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes, and tapes. 10 g/L max. VOC content.

B. Joint Sealant: Refer to sealant manufacturer's recommendations.

2.5 ENVIRONMENTAL

A. Adhesives: For adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24), provide printed statement of VOC content.

B. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

C. Verify that concrete has cured and aged for minimum time period recommended by barrier manufacturer.

D. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

E. Verify that masonry joints are flush and completely filled with mortar.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate, and sharp protrusions. Remove contaminants such as grease, oil, and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Refer to manufacturers literature for treating joints and exterior sheathing panels prior to the installation of the fluid applied air barrier.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete.

I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

J. At changes in substrate plane, apply sealant
   1. Basis of Design Product: PERM-A-BARRIER® S100 Sealant, or BITUTHENE® Liquid Membrane.
   2. Apply at sharp corners and edges to form a smooth transition from one plane to another.

K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, grout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.
   1. Prime substrate as required.

B. Gypsum Sheathing: Fill joints with GCP Applied Technologies PERM-A-BARRIER® S100 Sealant per manufacturer's written instructions.

3.4 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
   1. Vapor-Permeable Membrane Air Barrier: 20-mil (0.51-mm) thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that do not comply with requirements; repair substrates and reapply air barrier components.

3.5 TRANSITION MEMBRANE INSTALLATION

A. All transition membranes must be placed prior to application of VPL50.

B. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems,

glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition membrane to substrate with termination of PERM-A-BARRIER® S100 Sealant.

E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Apply transition membrane so that a minimum of 3 inches (76.2 mm) of coverage is achieved over both substrates.
   1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (152.4 mm) beyond repaired areas in strip direction.

I. For vertical applications work from a corner. Wrap the building completely, stopping at wall ends. Ends should be terminated at a furring strip of matching thickness to prevent air movement to adjoining wall. Butt edges of the mat together. Do not overlap.

J. At window and door openings install mat tightly to casings. Take care not to cut or damage weather-resistive barrier.

K. At the bottom of the mat, place a foundation weep screed, a “J’ weep screed, or flashing with weeps. Weather-resistive barrier and mat should be placed over top of the back piece of the weep screed, termination bar, or flashing to create the proper weather lap.

L. At wall terminations, place a wood termination strip along the outside edge of each wall to create a wind dam for negative wind load.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
   8. Termination sealant has been applied on cut edges.
   9. Strips and transition membrane have been firmly adhered to substrate.
   10. Compatible materials have been used.
   11. Transitions at changes in direction and structural support at gaps have been provided.
   12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
   13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
   1. Qualitative Testing: barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.

D. Remove and replace deficient air barrier components and retest as specified above.

3.7 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than 180 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION

SECTION 07 31 13 - ASPHALT SHINGLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Asphalt shingles.
   2. Underlayment.
   3. Metal flashing and trim.

1.3 REFERENCE STANDARDS

A. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2020.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2021.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

D. ASTM D3018/D3018M - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules; 2022.

E. ASTM D3161/D3161M - Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020 (Reapproved 2025).

F. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.

G. ASTM D7158/D7158M - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method); 2020.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

I. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.

J. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

K. UL 977 - Fused Power-Circuit Devices; Current Edition, Including All Revisions.

L. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Current Edition, Including All Revisions.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.
   1. Asphalt Shingles: Full size.
   2. Ridge Vent: 12-inch-long Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.

C. Evaluation Reports: For self-adhering sheet underlayment, from ICC-ES or other testing and inspecting agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.

D. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.

B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Manufacturing defects.
   2. Material Warranty Period: Forty (40) years warranty from date of Substantial Completion.
   3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds as indicated on Structural Plans ten (10) years from date of Substantial Completion.
   4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for ten (10) years from date of Substantial Completion.

B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, self-sealing and shingles shall be Class A and comply with ANSI/UL 790.
   1. Basis of Design: “Dimensional Architectural – Style to Match Existing” as manufactured by Certainteed.
      a. Florida Product Approval: FL #5444.R14.
   2. Algae Resistance: Granules resist algae discoloration.
   3. Impact Resistance: UL 2218, Class 4.
   4. Color and Blends: Weathered Wood – verify to match existing.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment Polyethylene Faced: ASTM D1970/D1970M, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release backing; cold applied.
   1. Basis of Design: “Winterguard” as manufactured by Certainteed Corporation.
   2. Underlayment shall comply with ASTM E108 and UL 790 Class A Classification under fiberglass shingles.

2.4 NAILABLE INSULATION

A. Composite polyisocyanurate insulation board bonded to 19/32” CDX plywood on top face.
   1. Basis of Design: “Cornell ThermaCal1 Nail Base Roof Insulation” as manufactured by GAF.
   2. Rating: Fire rated with LP FlameBlock Fire-rated OSB Sheathing
   3. Thickness: 4.5" at R-17.5.
   4. Insulation shall comply with ASTM C1289, Type ll, Class 1, Grade 2, ASTM E84 and ASTM E108 and UL 790 Class A classification under fiberglass shingles.

2.5 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section metal ridge vent for use under ridge shingles.
   1. Nonwoven geotextile filter strips.
   2. External deflector baffles.

2.6 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch (19.05 mm) into solid wood decking or extend at least 1/8 inch (3.18 mm) through OSB or plywood sheathing.
   1. Shank: Barbed.
   2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.7 METAL FLASHING AND TRIM

A. General: Comply with requirements in Specification Section "Sheet Metal Flashing and Trim."
   1. Sheet Metal: Aluminum.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

C. Vent Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.59 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (101.6 mm) from pipe onto roof.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SHEATHING INSTALLATION

A. Provide 5/8" fire-retardant sheathing per Section 06 16 00 - "Sheathing."

3.3 INSULATION INSTALLATION

A. Install specified insulation using approved method in accordance with manufacturer’s latest written instructions and as required by governing codes.

B. Install with end joints staggered to avoid having insulation joints coinciding with joints in deck. In multi-layer installations, stagger joints in top and bottom layers.

3.4 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (152.4 mm) staggered 24 inches (609.6 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Eaves: Extend from edges of eaves 24 inches (609.6 mm) beyond interior face of exterior wall.
   2. Rakes: Extend from edges of rake 24 inches (609.6 mm) beyond interior face of exterior wall.
   3. Valleys: Extend from lowest to highest point 18 inches (457.2 mm) on each side.
   4. Hips: Extend 18 inches (457.2 mm) on each side.
   5. Ridges: Extend 36 inches (914.4 mm) on each side without obstructing continuous ridge vent slot.
   6. Sidewalls: Extend beyond sidewall 18 inches (457.2 mm) and return vertically against sidewall not less than 4 inches (101.6 mm).
   7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches (457.2 mm) and return vertically against penetrating element not less than 4 inches (101.6 mm).
   8. Roof Slope Transitions: Extend 18 inches (457.2 mm) on each roof slope.

B. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch-wide underlayment centered in valley. Stagger end laps between layers at least 72 inches (1828.8

mm). Lap ends of each layer at least 12 inches (304.8 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck.

1. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (152.4 mm).

3.5 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Specification Section "Sheet Metal Flashing and Trim."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 2 inches (50.8 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket or Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches (203.2 mm) in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches (304.8 mm) apart and fastened to roof deck.
2. Adhere 9-inch-wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.

F. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.

G. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.

H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.6 ASPHALT-SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch (12.7 mm) over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

E. Fasten asphalt-shingle strips with roofing nails located according to manufacturer's written instructions.

1. Where roof slope exceeds 21:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

F. Woven Valleys: Extend succeeding asphalt-shingle courses from both sides of valley 12 inches (304.8 mm) beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in valley.

1. Do not nail asphalt shingles within 6 inches (152.4 mm) of valley center.

G. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches (304.8 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches (50.8 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
   1. Do not nail asphalt shingles within 6 inches (152.4 mm) of valley center.
   2. Set trimmed, concealed-corner asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.

H. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley.
   1. Set valley edge of asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.
   2. Do not nail asphalt shingles to metal open-valley flashings.

I. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

J. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
   1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.7 ROOFING INSTALLER'S WARRANTY

A. WHEREAS of , herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:
   1. Owner: .
   2. Address: .
   3. Building Name/Type: .
   4. Address: .
   5. Area of the Work: .
   6. Acceptance Date: .
   7. Warranty Period: .
   8. Expiration Date: .

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
   1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
      a. Lightning;
      b. Peak gust wind speed exceeding mph;
      c. Fire;
      d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      f. Vapor condensation on bottom of roofing; and

g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this day of , .
1. Authorized Signature: .
2. Name: .
3. Title: .

END OF SECTION

This page intentionally left blank

SECTION 07 41 13 - STANDING SEAM METAL ROOF PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Standing-seam metal roof panels.

1.3 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. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018.

G. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

H. ASTM B32 - Standard Specification for Solder Metal; 2020.

I. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

K. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

L. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

M. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.

N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

P. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres; 2020.

Q. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).

R. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2024).

S. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems; 2016 (Reapproved 2022).

T. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).

U. ASTM E2129 - Standard Practice for Data Collection for Sustainability Assessment of Building Products; Current.

V. CRRC-1 - CRRC-1 Roof Product Rating Program Manual; 2025.

W. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

X. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Current Edition, Including All Revisions.

Y. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

Z. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

AA. ASTM B32 – Standard Specification for Solder Metal.

BB. ASTM B117 – Salt spray testing of coating 1000 Hrs.

CC. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

DD. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

EE. ASTM D2178 – Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

FF. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

GG. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free.

HH. ASTM E 408/C - 1371 – "Standard Test Method for Total Normal Emittance of Surfaces Using inspection - Meter Techniques.

II. ASTM G 23 – Accelerated testing of coating 2000 hrs.

JJ. FM – Tests Requirements for Class 1 Panel roofs, Factory Mutual Research Corporation.

KK. FED A-A-51145 – Flux, Soldering, Non-Electronic, Paste and Liquid.

LL. NRCA (National Roofing Contractors Association) – Roofing Manual.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

1. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3" = 1'-0".

C. Samples: For each type of finish required, prepared on Samples of size indicated below.
   1. Metal Panels: 12 inches (304.8 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

D. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design requirements signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Manufacturer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 MOCK-UP

A. Mock-ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

B. Build mock-up of typical roof area and eave, including fascia, and soffit in a location selected by the architect; approximately 4 feet (121.92 cm) by 12 feet (365.76 cm) square by full thickness, including insulation, attachments, underlayment, and accessories.

C. Build mock-ups for typical roof area only, including accessories.

D. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.

E. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRE-INSTALLATION MEETINGS

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

B. If needed, insert list of conference participants not mentioned in specification section "Project Management and Coordination."

C. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.

D. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

E. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.

F. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

G. Review structural loading limitations of deck during and after roofing.

H. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.

I. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

J. Review temporary protection requirements for metal panel systems during and after installation.

K. Review procedures for repair of metal panels damaged after installation.

L. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have a minimum of ten (10) years experience in manufacturing panels of this nature, in a permanent stationary, indoor production facility.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, with a minimum five (5) years experience with roof as defined in these specifications.

C. Inspections
   1. The roof shall be inspected by the manufacturer's representative within the timeframe as indicated in accordance with IBC requirements.
   2. Provide at a minimum one in progress inspection with the Manufacturer's Representative and the Owner's Representative. The Manufacturer's Representative shall submit a written report of the inspection results within ten (10) days after the inspection to the Architect.
   3. Inspections: Provide on-site weekly inspections by Owner's representative during and after installation of roofing system.
   4. The Contractor shall provide the Architect of Record a "final statement of compliance" for the Owner once the Final Inspection has been completed, stating that the finished roof complies with the contractual documents in accordance with IBC requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Remove strippable protective covering on metal panels as panels are being installed. Do not leave the film on installed panels.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with roof panels by field measurements before fabrication.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

D. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing or perforating.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: 20 years and 6 months from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, chipping, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

C. Special Watertightness Warranty: Manufacturer's no dollar limit form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain watertight, including leaks, within specified warranty period.
   1. Warranty Period: Twenty (20) years from date of Substantial Completion.

D. Special Installer Warranty: Furnish a written warranty signed by the Panel Applicator for a two (2) year period from the date of substantial completion of the building guaranteeing materials and workmanship for watertightness of the roofing system, flashings, penetrations, and against all leaks.

1.13 PERFORMANCE REQUIREMENTS

A. Panel shall be designed in accordance with sound engineering methods and practices and in accordance with SMACNA, AAMA, and NRCA standards.

B. Roof structure shall be designed with proper recognition for the "floating system" which must exist to have a roof panel that meets expansion and contraction requirements.

C. Damaged panel replacement shall not require the use of through the roof fasteners.

D. Roof system shall have Underwriters Laboratories UL-90 wind uplift classification and comply with ANSI 58.1, and all applicable codes or applicable standard based on rating required. See structural drawings.
   1. The installation shall be designed to safely resist the positive and negative loads, as specified in the structural drawings.

E. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
   1. Wind Loads: As indicated on structural drawings.

F. Air Infiltration: Air leakage shall comply with the manufacturer’s testing data when tested according to ASTM E1680 and ASTM E 283 at the following test-pressure difference of 6.24 lbf./sq. ft.

G. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 and ASTM E331 at the following test-pressure difference of 6.24 lbf/sq. ft.

H. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

J. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

K. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees Fahrenheit (48.89 degrees Celsius), ambient; 180 degrees Fahrenheit (82.22 degrees Celsius).

L. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.

M. Delegated-Design: Provide delegated design services including calculations and shop drawings for load bearing items to comply with performance requirements, applicable code requirements and design criteria signed and sealed by an engineer registered in the State of South Carolina.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following however products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Peterson.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product.
   1. Imetco.
   2. Bemo USA.
   3. Fabral/Allan Building Products.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Basis of Design Product: “Snap-Clad Panel”.

B. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips inside laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

C. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and seaming panels together.
   1. Material: Minimum 0.032" aluminum pre-painted by the coil-coating process to comply with ASTM B209. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.
   2. Clips: Per product approval.
   3. Joint Type: Snap joint.
   4. Panel Coverage: 18" wide.
   5. Panel configuration: Longitudinal striations. Flat.
   6. Panel Height: 1 3/4" high ribs.
   7. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980, based on testing identical products by a qualified testing agency.

D. Energy Performance
   1. Provide roof panels according to one of the following when tested according to CRRC-1.
   2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E1980.
   3. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (1.016 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
   3. Manufacturer is as indicated however equal or better performing products of other manufacturers will be considered for acceptance by the Architect.
      a. Carlisle Construction Materials
      b. W.R. Meadows
      c. W. R. Grace

2.4 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Gutters: Formed complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Provide wire ball strainers of compatible metal at outlets. Finish gutters, strap and brackets to match metal roof panels.
   1. Gutters shall be minimum 6” wide x 6” deep and as indicated on drawings and sized to comply with SMACNA guidelines
   2. Material: fabricate from material thickness to comply with SMACNA standards.
   3. Gutter straps shall be 1” wide by 0.062 inch (1.57 mm) aluminum 0.027 (24-gauge) steel material and located at 36" o.c.
   4. Gutters support brackets shall be 1" wide by 0.080 inch (2.03 mm) aluminum 0.1084 inch (2.75 mm) steel material and located at 36" o.c.
   5. Gutter brackets and straps shall be alternately spaced so they are offset 18”.
   6. Gutters shall be in minimum 10’-0” long sections formed to provide flush exterior seams between gutter sections. Joints between gutter sections shall be 1/2” wide with 6” wide cover plates and support brackets to allow for expansion and contraction. Joints shall be fully bedded in sealant on inside joints.
   7. Expansion Joints: Butt type with cover plate.
   8. Finish and Gauge: To match roofing material.
   9. Material: Aluminum.
   10. Material: Steel.

D. Downspouts: Fabricate complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts and straps to match gutters.

1. Fabricate to sizes and configurations as indicated on the drawings.
2. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to kick-out diverter section at bottom of downspout.
3. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to tie into locations indicated.
4. Downspout bracket/straps: Straps shall be 1" wide by 0.080 inch (2.03 mm) aluminum 0.039 (20-gauge) steel material located not more than 60” o.c. with top and bottom brackets located not more than 12" from ends of downspouts. Bracket shall provide 1” clear distance between wall, adjacent surface and downspout. If required, insert special requirements for ridge corner units, copings, fascia, and fillers.
5. Finish: To match roofing material.
6. Material: Aluminum, 0.062 inch (1.57 mm) thick.
7. Material: Steel galvalume, 0.027 inch (0.69 mm)

E. PVC Downspout Connector: PVC downspout connector with square top and round discharge for connection to underground drainage system. Top and bottom openings shall conform tp downspout and storm drains sizes.
   1. Manufacturers: The basis of design is “DMV Downspout Adapter Offset”” as manufactured by Macon Plastics Inc. Equal or better performing products of other manufacturers will be considered for acceptance by the Architect.
   2. 2. PVC downspout adapter / connector shall be fabricated in a configuration that will allow for a 45- degree connection to the underground storm drainage system and avoid conflict with exterior wall footing.
   3. 3. If a 45-degree connection cannot be achieved, a 90-degree connection with a clean-out at the downspout location may be used.

F. PVC Downspout Connector: Provide 8” diameter PVC cleanout fitting with cap, provide opening in cap to accept downspout and seal fully around joint where downspout fits into cap.

G. Splash Pads: Provide and install precast concrete type, of sizes and profiles indicated; minimum 3000 psi (20684.28 kPa) at 28 days, with minimum 5% air entrainment.

H. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb sub-framing of 0.060-inch nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and sub-framing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
   1. Insulate roof curb with batt insulation.

I. Panel Fasteners: Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size as approved for the applicable loading requirements. Exposed fasteners, where approved by architect, shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration.

J. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape 1/2 inch (12.7 mm) wide and 1/8 inch (3.18 mm) thick.
   2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

K. Pipe Flashings
   1. Provide EPDM (ethylene propylene diene monomer) rubber flashings for vent pipe penetrations in metal roof. Provide clamping rings, sealant, and fasteners as recommended by manufacturer.

2.5 INSULATION

A. Insulation: Provide “AC Foam II” as manufactured by Atlas Roofing Corporation. Comply with ASTM 1289, Type II, Class 1, Grade 3.

B. Closed-cell HCFC FREE “Green” polyisocyanurate foam core manufactured using HCFC or ACUltra Hydrocarbon blowing agent and integrally laminated to heavy non-asphaltic fiber-reinforced felt facers with 25 psi (172.37 kPa) density.

C. R-Value: R-value shall be a minimum R-30 and 5” thick and as indicated on drawings.

D. Provide tapers and crickets of the same material as indicated on the drawings and as required to provide proper slope.

2.6 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using factory set, non-adjustable portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

B. High-Performance Organic Finish Three-Coat Fluoropolymer: Chemical Finish Organic Coating, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight. Complying with paint manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces to comply with AAMA 2605.
   1. Color and Gloss: As selected by Architect from full range of industry colors and color densities and custom colors.

C. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.0127 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

B. Verify that deck is structurally sound to support installers, materials and equipment without damaging or deforming work.
   1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

C. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

D. Verify that roof drains, scuppers, roof curbs, nailers, equipment supports, vents and other roof accessories are secured properly and installed in conformance with Contract Drawings and submittals.

E. Examine roof deck for suitability to receive insulation. Verify that substrate is dry, clean and free of foreign material that will damage insulation or impede installation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSULATION INSTALLATION

A. Install batt insulation using approved method in accordance with manufacturer’s latest written instructions and as required by governing codes.

3.4 COVER BOARD INSTALLATION

A. Coordinate installing roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof cover board.

C. Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6.35 mm) with cover board.

D. Cut and fit cover board within 1/4 inch (6.35 mm) of nailers, projections, and penetrations.

E. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

G. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

H. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

I. Fasten cover board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instruction.

3.5 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152.4 mm) staggered 24 inches (609.6 mm) between courses. Overlap side edges not less than 6 inches. Roll laps with roller. Cover underlayment within 14 days.
   1. Apply over the entire roof surface.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Specification Section "Sheet Metal Flashing and Trim."

3.6 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates (if required) at locations indicated in manufacturer's written installation instructions.
   3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied vinyl weatherseal.
   4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied vinyl weatherseal are completely engaged.
   5. Batten Seam Joint: Nest standing seams and fasten together by installing batten seam cap and completely engage factory-applied vinyl weatherseal.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (304.8 cm) with no joints allowed within 24 inches (609.6 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25.4 mm) deep, filled with mastic sealant (concealed within joints).

G. Roof Curbs: Install flashing around bases where they meet metal roof panels.

H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.7 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:
   1. Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914.4 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
   2. Fasten gutter spacers to front and back of gutter.
   3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   4. Anchor gutter with straps spaced as indicated and loosely lock to front gutter bead.
   5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (1524 cm) apart. Install expansion-joint caps.

C. Downspouts:
   1. Join sections with 1 1/2-inch (telescoping joints.
   2. Provide hangers with fasteners designed to hold downspouts securely 1 inch (25.4 mm) away from walls. Locate hangers at top and bottom and on center as indicated.
   3. Connect downspouts to underground drainage system.
   4. Stop downspout above ground, provide an elbow and install a splash block.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align substrate or framing within installed tolerance of 1/4 inch (6.35 mm) in 20 feet (609.6 cm) on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports and submit to Architect.

3.10 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

This page intentionally left blank

SECTION 07 46 46 - CEMENT BOARD SIDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Exterior wall panels.
   2. Exterior soffit boards.
   3. Exterior trim.

1.3 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1185 - Standard Test Methods for Sampling and Testing Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards; 2023.

C. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

D. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

G. ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials; 1995.

H. ASTM E 228 – Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica.

I. Dilatometer; 1995.

J. ASTM G 26 – Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials; 1996.

K. ASTM E 330 – Structural Performance of exterior windows, curtain walls and doors by uniform static air pressure difference.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. 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.

B. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious materials which are outside the scope of the standard details and specifications provided by the manufacturer.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 3 years experience with installation of similar products.

B. 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, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store material on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 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.

1.9 WARRANTY

A. Product Warranty: Manufacturer’s standard warranty that product will be free from manufacturing defects in material and workmanship for a period of 50 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects for a period of fifteen (15) years.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Allura: www.allurausa.com.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. James Hardie Building Products, Inc: www.jameshardie.com.
   2. GAF WeatherSide Fiber-Cement Siding: www.gaf.com.
   3. Exo Surfaces: www.exo-surfaces.com.

2.2 EXTERIOR WALL PANELS, SOFFIT BOARDS, AND TRIM

A. Material: Cement, recycled content and cellulose fiber formed under high pressure into boards with integral surface texture; complying with ASTM C1186 Type A Grade II; machined edges; for nail attachment.
   1. Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5, maximum; when tested in accordance with ASTM E84 (Class I/A).
   2. Flammability: Noncombustible, when tested in accordance with ASTM E136.
   3. Flexural Strength: At least 1450 psi (9997.40 kPa) when in equilibrium condition, and at least 1015 psi (6998.18 kPa) when in wet condition, tested in accordance with ASTM C1185.

4. Coefficient of Thermal Expansion: Less than 1 x 10^-5/inch/inch/degree F (0.5 x 10^-5/degree C), when tested in accordance with ASTM E 228.
5. UV Resistance: No cracking, checking, or erosion, when tested for 2000 hours in accordance with ASTM G 26.
6. Water Tightness: No water droplets on underside, when tested in accordance with ASTM C1185.

B. Wall Panels:
1. Basis of Design Product: "Smooth Vertical Panel."
2. Thickness: 5/16 inches (8mm).
3. Texture: Smooth.
4. Finish: Factory-finished with manufacturer's recommended protective coating.

C. Soffit Boards:
1. Thickness: 1/4 inches (6mm).
2. Size: As indicated on Drawings.
3. Vented.
4. Texture: Smooth.
5. Finish: Factory-finished with manufacturer's recommended protective coating.

D. Trim:
1. Thickness: 4/4 (3/4 inches (19mm)).
2. Sizes:
   a. 1 x 3.
   b. 1 x 6.
   c. 1 x 12.
3. Texture: Smooth.
4. Finish: Factory-finished with manufacturer's recommended protective coating.

E. Color: As selected by Architect from manufacturer's standard line of color selections.

2.3 ACCESSORIES

A. Sealant: Paintable, 100 percent acrylic latex caulk complying with ASTM C920.

B. Sheet Metal Flashing: Minimum 26 gauge hot-dipped galvanized steel sheet, or coated aluminum.

C. Nails: Length as required to penetrate minimum 1-1/4 inch (32 mm) into solid backing; hot-dipped galvanized or stainless steel.

D. Building Paper: Kraft or bituminous paper; not polyethylene or foil.

2.4 FINISHES

A. Factory Primer: Provide factory applied universal primer.
1. Primer: Factory primed by manufacturers standard.
2. Topcoat: Refer to Exterior Painting specification.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installing material, examine framing work for completion and complete work as required.

3.2 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install, plumb, level, true, and straight with no distortions. Shim as required using concealed shims.

3.3 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Manufactured Products:
      a. Manufactured flashing and counterflashing.
      b. Manufactured coping.
   2. Formed Products:
      a. Formed low-slope roof sheet metal fabrications.
      b. Formed wall sheet metal fabrications.
      c. Formed roof drainage sheet metal fabrications.

1.3 REFERENCE STANDARDS

A. AISC – Stainless Steel, Uses in Architecture.

B. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

D. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A666- Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

F. ASTM B32 – Standard Specification for Solder Metal.

G. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

H. AWS A2.4 – Standard Symbols Welding, Brazing, Nondestructive Examination.

I. AWS – Structural Welding Code.

J. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free.

K. FED A-A-51145 – Flux, Soldering, Non-Electronic Paste and Liquid.

L. NRCA (National Roofing Contractors Association) – Roofing Manual.

M. SMACNA – Architectural Sheet Metal Manual.

N. AAMA 606.1 – Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.

O. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

P. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

Q. AAMA 612 – Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum.

R. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedure for Superior Performing Organic Coating on Aluminum Extrusions and Panels.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings:
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
   3. Include identification of material, thickness, weight, and finish for each item and location in Project.
   4. Include details for forming, including profiles, shapes, seams, and dimensions.
   5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   6. Include details of termination points and assemblies.
   7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
   8. Include details of roof-penetration flashing.
   9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
   10. Include details of special conditions.
   11. Include details of connections to adjoining work.
   12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Accessories and Miscellaneous Materials: Full-size Sample.

D. Delegated-Design Submittal: Contractor shall engage a qualified professional engineer, licensed in the State of South Carolina, to design calculations, analysis data, and shop drawings - indicating compliance with dedicated design requirements, and signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. All welding personnel affiliated with the site construction shall be approved certified welders and shall supply certified welding certificates to the Architect prior to commencing work.

C. Applicator/Installer shall be a company specializing in sheet metal flashing work with minimum 5 years experience.

D. Job supervisor shall have minimum 5-years of documented trade experience in supervision on projects of this size and type.

E. Except as otherwise indicated, the workmanship of sheet metal work, method for forming joints, anchoring, cleating and provisions for expansion shall conform to the standard details and recommendations of the Copper Development Association and the "Architectural Sheet Metal Manual" published by SMACNA; and workmanship shall be of the best quality, in accordance with best trade practice and the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc.

F. All roofing metals shall be furnished and installed by the roofing contractor.

1.8 MOCK-UP

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

B. Build mockup of typical roof edge, coping, flashing, fascia, counterflashing and other applicable sheet metal items approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.

C. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PREINSTALLATION MEETINGS

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

B. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

C. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.

D. Review requirements for insurance and certificates if applicable.

E. Review sheet metal flashing observation and repair procedures after flashing installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.11 FIELD CONDITIONS

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Provide installer’s five (5) year written warranty for sheet metal indicated.

B. Sheet metal shall resist design wind speeds required by International Building Code in which installer agrees to repair or replace flashing components of roofing system that fail in materials or workmanship within specified warranty period.

C. Sheet metal failures shall include water leaks, fasteners, accessories, flashing and sheet metal, grounds/nailers, scuttles and vents, curbs, and other flashing components of roofing system.

D. Warranty shall be a term type, with no conditions, exclusions, including exclusions of remedies by Owner, deductibles or limitations on coverage amount. Conditions, exclusions, or dollar limits.

E. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

1.13 PERFORMANCE REQUIREMENTS

A. General: Sheet metal assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard: Comply with NRCA's "The NRCA Roofing Manual" SMACNA's "Architectural Sheet Metal Manual" requirements for unless more stringent requirements are indicated.

C. High performance edge details must be selected from manufacturers who certify performance to meet design requirements, based upon testing of such products using the test methodologies RE 1, RE-2, and/or RE-3 as referenced by the SPRI Wind Design Guide for use with Low Slope Roofing" (April 1994). Other designs may be used, provided they are tested and certified to meet wind resistance and termination tests established for the projects building height, ground roughness factor, local wind speeds, and geographic location.
   1. Uplift requirements shall match requirements specified for adjacent membrane roofing.
   2. Wind resistance calculation will be designed specifically for the current project.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated on Drawings.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

F. Delegated-Design: Contractor shall engage a qualified professional engineer, licensed in the State of South Carolina, to design calculations, analysis data, and shop drawings - indicating compliance with dedicated design requirements, and signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer for manufactured sheet metal flashing and trim shall be one of the following. However products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.

1. Manufactured Sheet Metal Flashing and Trim:
   a. OMG Roofing Products.
   b. Metal-ERA, Inc.
   c. Architectural Products Company.
   d. Fry Reglet.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Fabricate size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual" which shall take precedence over sizes and metal thickness listed within the specification.

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Thickness: 0.050 inch minimum at all locations unless indicated otherwise.

D. Solder: Per ASTM B32.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing. Provide primer according to written recommendations of underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

B. Manufacturers and products are as indicated however equal or better performing products of other manufacturers will be considered for acceptance by the Architect.
   1. "WinterGuard HT," CertainTeed Corp.
   2. "Grace Ultra," Grace Construction Products
   3. "TW Metal and Tile Underlayment," Tamko Roofing Products

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength stainless-steel rivets suitable for metal being fastened.
      c. Fasteners for Aluminum Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Epoxy Seam Sealer: Two-part, noncorrosive, seam-cementing compound, recommended by manufacturer for exterior nonmoving joints, including riveted joints.

F. Solder: Shall conform to ASTM B32 66T. Composition shall contain 50 percent tin and 50 percent lead, except as specified otherwise. Solder for metal shall be of composition as recommended by the metal manufacturer.

G. Flux: Use resin type flux for pretinned surfaces.

H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

I. Flexible Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by flexible flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

J. Flexible Tubing: Tube with flexible flashing shall be equal to B.F. Goodrich. The tube shall be made from closed cell synthetic rubber foam.

K. Water barrier (vapor barrier) under cradle to expansion joint shall be equal to B.F. Goodrich's 20 mil "Lexsuco" PVC.

L. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M, formulated for 30-mil thickness per coat.

M. Roofing Cement: ASTM D2822, Asphaltic.

N. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.

O. Gutter Sealant and Adhesive: One-part synthetic rubber and resin elastomeric adhesive “Gutter Seal” as manufactured by Tremco Commercial Sealants and Waterproofing.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. General: Manufactured products that terminate roofing shall be provided by or approved by the roofing system manufacturer for inclusion in roofing manufacturer’s warranty.

B. Reglets and Counterflashings: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.
   1. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
   2. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where drawings show reglet without metal counterflashing.
   3. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

C. Coping: Interlocking multi-part coping system consisting of coping formed to profile and size indicated. Provided butted joints with expansion space and 8-inch minimum wide cover and concealed backup plate. Provide minimum 20-gauge, zinc-coated steel anchor plate at coping joint and anchorage cleats. Provide formed gutter chair with prefabricated inside and outside corners, miters soldered before finishing; without exposed fasteners. All fasteners shall be stainless steel.
   1. Material: Aluminum, 0.050 inch (16-gauge) minimum.

D. Through-Wall Flashing: Fabricate continuous through-wall flashings in minimum 96-inch long, but not exceeding 12-foot long sections. Fabricate through-wall flashings to extend 6 inches

beyond each side of wall openings and form with 2-inch high, end dams. Fabricate from the following materials:

1. Material: Stainless Steel: 0.018” (26-gauge) thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Sheet metal fabrications that terminate roofing shall be provided by or approved by the roofing system manufacturer for inclusion in roofing manufacturer’s warranty.

B. General:
   1. Shop fabricate in minimum 96-inch long, but not exceeding 10-foot long, sections.
   2. Fabricate joint plates of same thickness as sheet metal item.
   3. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg unless indicated otherwise. Shop fabricate soldered interior and exterior mitered corners, splices extending 6" each way as applicable.

C. Stucco Stop with Counter-flashing (2-piece)
   1. Provide receiver with 1.5” wall flange, 0.75” sloping stucco stop, and 0.75” flange bend downward with 0.50” hem or as indicated on drawings.
   2. Shop punch wall flange for fastening.
   3. Provide counterflashing with 1.5” 45° top flange with 0.35” kick back at top and 4” bottom flange formed inward 3/4” towards wall with hemmed 0.25” kick at bottom or as indicated on drawings.
   4. Provide 1.5” x 4” storm cleats.

D. Stucco Stop with Counter-flashing (1-piece for re-roofing):
   1. Provide counterflashing with 0.50" 45° leg for sealant with 1.5" wall flange with a 4" bottom flange formed inward 0.75" towards wall with hemmed 0.50" kick at bottom or as indicated on drawings.
   2. Shop punch wall flange for fastening.

E. Surface Mounted Flashing (1-piece):
   1. Provide flashing with 1.50" wall flange with 0.25" kick at top to receive sealant, 0.50" 135° sloping top flange and 4" bottom flange formed inward 0.75" towards wall with hemmed 0.50" kick at bottom or as indicated on drawings.
   2. Shop punch wall flange for fastening to meet wind loads per IBC.

F. Curb to Duct Flashing and Counter Flashing:
   1. Fabricate to fit duct curbs and ducts projecting from curbs.
   2. Provide 4” vertical flange to cover top edge of bituminous base flashings. Form flange bottom towards curb, with 1/4” bottom edge bent 1/4” out and hemmed.
   3. At top of curbs bend metal 90° and extend horizontally over to duct, then bend upward and extend vertically not less than 3” from top edge of flashing out 3/8” to receive sealant.
   4. Provide for field soldered lap joints at corners and 1” lap joints at horizontal miter splices.

G. Edge Drips and Fascia:
   1. Provide continuous cleat with punched holes spaced as necessary. If cleat extends 6” or more below top fastener, provide second row of punched holes spaced as necessary.
   2. Provide 4” roof flange and extend bottom drip not less than 1” below bottom of roof sheathing, with bottom 3/4” kick-out to drip water away from finish wall.
   3. Material: Aluminum, 0.050 inch (16-gauge).
   4. Material: Aluminum, 0.063 inch (14-gauge) two story.

H. Fascia:
   1. Premanufactured fascia with interlocking concealed splice plates.
   2. Provide factory fabricated miters, scuppers where indicated and drainage accessories.
   3. Provide anchor bar EPDM splice plates and fasteners.
   4. Material: Aluminum 0.063” thick

5. Basis of Design: “Anchor-Tite Standard Fascia (Shallow fascia) or Anchor-Tite Extended Fascia (Deep fascia)” as manufactured by Metal Aire.

I. Expansion Joint Cover:
1. Provide expansion joint covers at exterior expansion joints and fabricate in configurations indicated. Lap joints minimum 4” in direction of water flow.
2. Basis of Design: “Expand-O-Flash” are manufactured by Johns Manville. Equal or better performing products of other manufacturers will be considered for acceptance by the Architect
3. Sheet EPDM reinforced with closed cell urethane backing.
4. Roof expansion joint: Style CF with FS-5000-F fire barrier or as required by expansion joint manufacturer.
5. Roof to wall joint: Style CF/EJ with FS-5000-F fire barrier or as required by expansion joint manufacturer.
6. Exterior vertical and horizontal wall surface joints above roof deck: WS with FS-5000-W fire barrier or as required by expansion joint manufacturer.
7. Intersections and Transitions: Provide expansion joint manufacturers standard and custom intersections, transitions and miscellaneous items to provide a complete expansion joint system. All items provided shall be a standard of the expansion joint manufacturer.

J. Pipes, Conduits, Wires, and Round Equipment Supports Penetrating Roofing or Resting on Roofing:
1. Pre-manufactured roof penetration seals, Type 304 stainless steel, 26-gauge, complying with ASTM A240.
2. Form tubular stainless steel sleeves sized to shape of penetration, not less than 8” above finished roofing with 4” wide base flange welded to water-tight to sleeve.
3. Shop punch flanges.
4. Seal flashing and cover with protective umbrella.

K. Sanitary Vent Stack Flashings:
1. 4 lb per ft² lead flashing.
2. Form tubular lead flashing sleeve not less than 9” high with diameter 1/2” larger than vent stack.
3. Provide 4” wide flange soldered water-tight.
4. Provide vandal-proof vent covers.

2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof, fasten gravel guard angles to base of scupper.
1. Fabricate to sizes, profiles and details shown on the drawings.
2. Lock seam corners, solder water-tight and hem outer exposed edges.
3. Provide 4” wide minimum flanges formed to fit cants, decks and vertical wall surface.
4. Shop punch flanges for fastenings at 6" on center.
5. Scuppers shall be so designed that they prohibit capillary action of water and extend/project far enough away from the parapet wall surface that staining will not occur on the adjacent wall surface.

B. Collector Box: Fabricate collector box with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes and built-in overflows.
1. Fabricate to sizes, profiles and details shown on the drawings.
2. Lock seam corners, solder water-tight and hem outer exposed edges.
3. Provide 4” wide minimum flanges formed to fit cants, decks and vertical wall surface.
4. Shop punch flanges for fastenings at 6” on center.

5. Provide 4” diameter overflow holes on both sides of collector box with stainless steel screens over the holes located on the inside face of collector box.
6. Collector box shall be so designed that they prohibit capillary action of water and extend/project far enough away from the parapet wall surface that staining will not occur on the adjacent wall surface.
7. Material: Aluminum 0.062 inch (14-gauge).

C. Collector Box Downspouts: Fabricate complete with formed elbows and offsets, of size and metal thickness according to SMACNA’s “Architectural Sheet Metal Manual.” Finish downspouts and straps to match gutters.
1. Fabricate to sizes and configurations as indicated on the drawings.
2. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to kick-out diverter section at bottom of downspout where indicated on the drawings.
3. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to tie into locations for underground drainage system where indicated on the drawings.
4. Provide 8" diameter PVC cleanout fitting with cap, provide opening in cap to accept downspout and seal fully around joint where downspout fits into cap
5. Downspout bracket/straps: Straps shall be 1" wide by 0.080 inch (12-gauge) material located not more than 60” o.c. with top and bottom brackets located not more than 12" from ends of downspouts.
6. Material: Aluminum 0.062 inch (14-gauge).

D. Gutters: Formed complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Provide wire ball strainers of compatible metal at outlets. Finish gutters, strap and brackets to match metal roof panels.
1. Gutters shall be minimum 6” wide x 6” deep and as indicated on drawings and sized to comply with SMACNA guidelines.
2. Material: Fabricate from material thickness to comply with SMACNA standards.
3. Gutter straps shall be 1” wide by 0.062 inch (14-gauge) material and located at 36" o.c.
4. Gutters support brackets shall be 1" wide by 0.080 inch (12-gauge) material and located at 36" o.c.
5. Gutter brackets and straps shall be alternately spaced so they are offset 18”.
6. Gutters shall be in minimum 10'-0" long sections formed to provide flush exterior seams between gutter sections. Joints between gutter sections shall be 1/2" wide with 6" wide cover plates and support brackets to allow for expansion and contraction. Joints shall be fully bedded in sealant on inside joints.
7. Expansion Joints: Butt type with cover plate.
8. Material: Aluminum, fabricate from material thickness to comply with SMACNA standards.

E. Downspouts: Fabricate complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts and straps to match gutters.
1. Fabricate to sizes and configurations as indicated on the drawings.
2. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to kick-out diverter section at bottom of downspout where indicated on the drawings.
3. Downspouts shall be as indicated on drawings and fabricated in one continuous piece down to tie into locations for underground drainage system where indicated on the drawings..
4. Downspout bracket/straps: Straps shall be 1" wide by 0.080 inch (12-gauge) material located not more than 60” o.c. with top and bottom brackets located not more than 12" from ends of downspouts. Bracket shall provide 1” clear distance between wall, adjacent surface and downspout per SMACNA Fig. 1-35H. If required, insert special requirements for ridge corner units, copings, fascia, and fillers.
5. Material: Aluminum, 0.050 inch (16-gauge) 0.062 inch (14-gauge) thick extruded.

F. PVC Downspout Connector: PVC downspout connector with square top and round discharge for connection to underground drainage system. Top and bottom openings shall conform to downspout and storm drains sizes.
   1. Manufacturers: The basis of design is “DMV Downspout Adapter Offset”” as manufactured by Macon Plastics Inc. Equal or better performing products of other manufacturers will be considered for acceptance by the Architect.

G. PVC downspout adapter / connector shall be fabricated in a configuration that will allow for a 45-degree connection to the underground storm drainage system and avoid conflict with exterior wall footing.
   1. Manufacturers: The basis of design is “DMV Downspout Adapter Offset”” as manufactured by Macon Plastics Inc. Equal or better performing products of other manufacturers will be considered for acceptance by the Architect.
   2. PVC downspout adapter / connector shall be fabricated in a configuration that will allow for a 45- degree connection to the underground storm drainage system and avoid conflict with exterior wall footing.
   3. If a 45-degree connection cannot be achieved, a 90-degree connection with a clean-out at the downspout location may be used.

H. Roof Drain Flashing:
   1. Minimum 4 lb per ft² lead sheet flashing, 36” x 36” installed in accord with NRCA specifications.

I. Splash Pads: Provide and install precast concrete type, of sizes and profiles indicated; minimum 3000 psi at 28 days, with minimum 5% air entrainment.

2.8 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Comply with details shown and with applicable requirements of SMACNA Architectural Sheet Metal Manual.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Do not use graphite pencils to mark metal surfaces.

2.9 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

B. Aluminum Surfaces: Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

C. Stainless Steel: Mill 2B Cold Rolled Finish.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

F. Clear Anodic Finish: Mechanical Finish, nonspecular as fabricated Chemical Finish, etched Anodic Coating, clear coating 0.7mils or thicker complying with AAMA 612. Complying with paint manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces.
   1. Mill 2B Cold Rolled Finish

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by installing underlayment and cover with slip sheet. or other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in specification section "Joint Sealants."

G. Rivets: Rivet joints necessary for strength.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in wind load design.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes.
3. Weld corners.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.

Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Scuppers:
   1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

C. Collector Box:
   1. Continuously support collector box, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   2. Anchor collector box closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
   3. Loosely lock front edge of scupper with collector box.
   4. Seal with elastomeric sealant exterior wall scupper flanges into back of collector box.

D. Collector Box Downspouts:
   1. Join sections with 1-1/2-inch telescoping joints.
   2. Provide hangers with fasteners designed to hold downspouts securely to walls.
   3. Locate hangers at top and bottom and on center as indicated.
   4. Connect downspouts to underground drainage system where indicated on the drawings.
   5. Stop downspout above ground and install a splash block where indicated on the drawings.

E. Hanging Gutters:
   1. Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
   2. Fasten gutter spacers to front and back of gutter.
   3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   4. Anchor gutter with straps spaced as indicated and loosely lock to front gutter bead.
   5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

F. Downspouts:
   1. Join sections with 1-1/2-inch telescoping joints.
   2. Provide hangers with fasteners designed to hold downspouts securely 1 inch away from walls. Locate hangers at top and bottom and on center as indicated.
   3. Connect downspouts to underground drainage system where indicated on the drawings.
   4. Stop downspout above ground and install a splash block where indicated on the drawings.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Requirements including but not limited to:
   1. Control and expansion joints on exposed surfaces.
   2. Perimeter joints between wall surfaces and frames of doors and openings.
   3. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   4. Joints indicated or as necessary.
   5. Accessories necessary for a complete installation.

1.3 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

J. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.

K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

L. ASTM E2129 - Standard Practice for Data Collection for Sustainability Assessment of Building Products; Current.

M. NFPA 1 - Fire Code; 2024.

N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Product Data: Technical data for each joint sealant product. Submit written certification from manufacturers of sealants attesting products are suitable for use indicated, verified through in house testing laboratory.
   1. Written certification from manufacturers of joint sealants attesting that products comply with specification requirements and suitable for use indicated verified through manufacturers

testing laboratory within the past 36 months or since most recent reformulation, whichever is most recent.
   a. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.
   b. Manufacturer's letter, clearly indicating proposed lot numbers of each sealant supplied and expiration date sequence.
   c. Instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant.
2. VOC Data: Submit manufacturer’s product data for sealants. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
3. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

B. Certificates and Reports:
1. Product Certificates: Manufacturer's product certificate for each kind of joint sealant and accessory.
2. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
4. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   a. Materials forming joint substrates and sealant backings have been tested for compatibility and adhesion with sealants.
   b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
5. Preconstruction Field Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.
6. Field Adhesion Test Reports: For each sealant application tested.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Firm having minimum 5 years documented experience and specializing in the installation of sealants.
1. Exposed sealant work (sealants used for air and weatherseals external to curtain wall systems at perimeter, metal panel to panel joints) shall be performed by a single (i.e. one) firm specializing in the installation of sealants who has successfully produced work comparable to project.
2. Concealed sealant work (sealants which are internal to metal framed curtain wall systems, skylights, and providing an air seal) shall be the responsibility of the subcontractor providing erection of the respective system.

B. Source Limitations: Obtain each type of joint sealant from a single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
2. Test according to SWRI Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion in peel, and indentation hardness.

D. Environmental Requirements:
1. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials.
   a. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer written instructions to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F (4.4 degrees C).
   2. When joint substrates are wet. Should joints or backing materials become wet, remove and replace backing material with new.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.9 WARRANTY

A. Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealant work which has failed to provide a weathertight system within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Warranties: Written warranties (weatherseal and stain resistance), signed by sealant manufacturer agreeing to furnish joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or appear to deteriorate in manner not specified in the manufacturer's data as an inherent quality of the material within specified warranty period.
   1. Warranty Period: 5 years from date of Substantial Completion, 20 years for silicone sealants.

C. Warranties specified exclude deterioration or failure of sealants from:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Dow Corning®.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 MATERIALS

A. Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates, air barrier system, and masonry under conditions of service and application, as stated by sealant manufacturer's published data, and as substantiated by the manufacturer for each application through testing.

B. Liquid Applied Sealants: Comply with ASTM C920 and requirements indicated for each liquid applied sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain Test Response Characteristics: For sealants in contact with porous substrates, provide non-staining products that have undergone testing according to ASTM C1248 and do not stain porous joint substrates.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors: For fully concealed joints, provide standard color of sealant that has the best overall performance characteristics for the application shown. For exposed joints, match adjacent surface. For exposed joints, submit color samples to architect for approval, from manufacture's full line of standard colors.

F. Manufacturer's Representative: Use sealant produced by manufacturer who agrees to send a qualified technical representative to site upon request for the purpose of rendering advice concerning the recommended installation of manufacturer's materials.

G. Sealants: Self leveling compounds for horizontal joints in pavements and non-sag compounds elsewhere except as shown or specified.

H. Silicone Sealant: ASTM C920 Type S, Grade NS, Class 50.
   1. Basis of Design Product:
      a. 995 Structural Silicone Sealant.
   2. Use: All Working Joints and Exposed Exterior Locations.
   3. Properties: One-part, neutral-cure, non-sag silicone sealant; FS TT-S-00230C, Type II, Class A; SWRI validated..
   4. Movement: Plus or minus 50 percent capability at vertical joints.

I. Silicone Sealant: ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O.
   1. Basis of Design Product:
      a. 756 Silicone Building Sealant - HP with Additive manufactured by Dow Corning.
   2. Use: Precast Concrete Joints between metals, glass, and plastics (Two part silicone sealants).
   3. Properties: Performance: Non-staining, non-bleeding, and non-streaking to sealed and adjacent substrates. The minimum pli value after 7 day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion and Peel.
   4. Cure System and Oil Content: Neutral Cure System specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.

J. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 50, use NT.
   1. Basis of Design Products:
      a. Omniseal 50 manufactured by BASF Building Systems.
      b. 756 SMS, 791, 795, and/or 995 (as applicable) manufactured by Dow Corning Corporation.
      c. Silicones; SilGlaze II SCS2800, SilPruf NB SCS9000, SilPruf SCS2000, or UltraPruf II SCS2900 (as applicable) manufactured by GE Advanced Materials.
      d. SikaSil-C995 manufactued by Sika Corporation, Construction Products Division.

2. Use: Precast Concrete Joints between metals, glass, and plastics (Single component sealants).
3. Properties: Performance: Non-staining, non-bleeding, and non-streaking to sealed and adjacent substrates.
4. Cure System and Oil Content: Neutral Cure System specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.

K. Polyurethane Sealants: ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O.
1. Basis of Design Products:
   a. Sonolastic NP-2 manufactured by BASF Building Systems.
   b. Dynatred manufactured by Pecora Corporation.
   c. Sikaflex 2c NS or Sikaflex 2c NS TG (as applicable) manufactured by Sika Corporation, Construction Products Division.
2. Use: Typical Wall and Floor Joints (Two part polyurethane sealants).
3. Properties: Performance: Non-staining, non-bleeding, non-streaking to sealed and adjacent substrates.

L. Two Part Polyurethane Sealants: ASTM C920, Type M, Grade NS, Class 50; use NT, M, A and O.
1. Basis of Design Products:
   a. NP 2 manufactured by BASD Construction Chemicals.
   b. Permathane SM 7200 manufactured by Schnee-Morehead, Inc.
   c. Sikaflex - 2c NS TG manufactured by Sika Corporation, Inc.
2. Use: Typical Wall and Floor Joints (Two Part Polyurethane Sealants).
3. Properties: Performance: Non-staining, non-bleeding, and non-streaking to sealed and adjacent substrates. The minimum pli value after 7 day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion in Peel.

M. Mildew Resistant Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, Substrate uses G, A, and O; and containing fungicide for mildew resistance; acid curing.
1. Basis of Design Products:
   a. Omniplus manufactured by BASF Building Systems.
   b. 786 Mildew Resistant Silicone Sealant manufactured by Dow Corning.
   c. Sanitary SCS 1700 manufactured by GE Silicones.
2. Use: Joints at toilet fixtures, toilet room countertops and vanities, wet areas, and janitor closet mop receptor to wall transition.

N. Latex Sealant: Non-elastomeric, one part, non-sag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C834, Type OP (opaque sealants):
1. Basis of Design Products:
   a. AC-20 + Silicone manufactured by Pecora Corporation.
   b. Sonolastic Sonolac manufactured by BASF Building Systems.

O. Acoustical Joint Sealant: Non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
1. Basis of Design Products:
   a. Products manufactured by Hilti, Inc.
   b. AC-20 FTR or AIS-919 manufactured by Pecora Corporation.
   c. Products manufactured by Specified Technologies, Inc.
   d. SHEETROCK Acoustical Sealant manufactured by USG Corporation.

P. Sealant Backing: Provide sealant backings that are non-staining; compatible with joint substrates, sealants, primers, and joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. Basis of Design Products:
      a. Sonolastic Closed-Cell Backer-Rod manufactured by BASF Construction Chemicals.
      b. HBR Closed Cell Backer Rod manufactured by Nomaco, Inc.
   2. Cylindrical Sealant Backings: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding backings of flexible plastic foam complying with ASTM C1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.
   3. Type C: Closed cell polyethylene foam material with surface skin, nonabsorbent to liquid water and gas, non-outgassing in unruptured state; one of the following:

Q. Butyl Mastic Tape: High-tack, self-fusing butyl rubber mastic.
   1. Basis of Design Product:
      a. Butyl Mastic Tape 2212 manufactured by 3M.
   2. Compatible with air barrier system.
   3. Locations: At masonry veneer anchors and where indicated on Drawings.

R. Miscellaneous Materials:
   1. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.
   2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
   3. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surface adjacent to joints to which it is applied.
   4. Cork Joint Filler: Resilient and non-extruding ASTM D1752, Type II.
   5. Bond Breaker Tape: Polyethylene, TFE fluorocarbon, or plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and conditions affecting sealant performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with the recommendations of joint sealant manufacturer and requirements:
   1. Remove foreign material from joint substrates interfering with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), existing joint sealants, oil, grease, water, surface dirt, and frost.
   2. Clean concrete, masonry, unglazed surfaces of tile and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
   3. Remove laitance and form-release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior testing and experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. Glazing Sealants: Refer to Section 08 80 00 - Glazing.

B. Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

C. Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants applicable to materials, applications, and conditions indicated.

D. Sealant Backings: Install sealant backings to support sealants during application and at position necessary to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that become wet before sealant application and replace with dry sealant backings.
   4. Install bond breaker tape behind sealants where backings are not used between sealants and back of joints.

E. Weeps and Vents: Install weeps and vents into joints at the same time sealants are being installed. Locate weeps and vents spaced recommended by sealant manufacturer and the window and curtain wall fabricator and erector. Do not install weeps and vents at outside building corners. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.

F. Sealants: Install sealants by proven techniques resulting in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at same time sealant backings are installed.
   1. Apply sealants in depth in accordance with manufacturer's recommendations and recommended general proportions and limitations.
   2. Apply elastomeric sealants, in joints not subject to traffic or abrasion, to a depth equal to 50% of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).
   3. Apply non-elastomeric sealants to a depth approximately equal to the joint width.

G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave.
   1. Use masking tape to protect adjacent surfaces of recessed tooled joints.
   2. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
   3. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field Adhesion Testing: Field test exterior wall joint sealant adhesion to joint substrates:
   1. Extent of Testing: Test completed and cured sealant joints:
      a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
      b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer field adhesion hand pull test criteria.
   4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality: Provide temporary ventilation during work. Coordinate interior application of sealants with interior finishes schedule.

3.6 CLEANING AND PROTECTION

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

B. Protect joint sealants during and after curing from contact with contaminating substances and from damage so sealants are without deterioration or damage at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

This page intentionally left blank

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Standard hollow metal doors and frames.

1.3 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames; 2022.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

K. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2019.

L. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Minimum Thickness.
   2. Standard Hollow Metal Work.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, temperature-rise ratings, and finishes.

B. 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.
   5.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.
   10. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.11 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Amweld Building Products, LLC.
   2. Ceco Door Products; an Assa Abloy Group company.
   3. Curries Company; an Assa Abloy Group company.

4. Republic Doors and Frames.
5. Steelcraft; an Ingersoll-Rand company.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, mineral-board, or vertical steel-stiffener core.
    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
        1) Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than R-2.4 when tested according to ASTM C1363.
        2) Locations: Exterior doors interior doors where indicated.
        3) Fill material: Fill voids in door with manufacturer's standard polystyrene, polyurethane, polyisocyanurate insulating materials to meet project requirements.
3. Vertical Edges for Single-Acting Doors: Beveled edge.
    a. Beveled Edge: 1/8 inch (3.18 mm) in 2 inches (50.8 mm).
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless).
   2. Thermally insulated.

C.
   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as full profile welded unless otherwise indicated.
   3. Frames for Level 4 Steel Doors: 0.067-inch- thick steel sheet.

C.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as full profile welded unless otherwise indicated.
      a. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
   3. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.
      a. Frames for Wood Doors: 0.053-inch- thick steel sheet.
   4. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5

A. Floor Anchors: Formed from same material as frames, not less than [0.042] inch ([1.07] mm) thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.81 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (15.88 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.81 mm) thick, fabricated from same material as frames in which they are installed.

D. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches (152.4 mm) above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.7 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
   1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.41 mm) thick.

2.9

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C.

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19.05 mm) beyond edge of door on which astragal is mounted.

D.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. 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.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, 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.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
    a. Provide loose stops and moldings on inside of hollow metal work.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
    1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.1 EXAMINATION

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
    1. Squareness: Plus or minus [1/16] inch ([1.59] mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    2. Alignment: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a horizontal line parallel to plane of wall.
    3. Twist: Plus or minus 1/16 inch (1.59 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    4. Plumbness: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
    1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
        a. At fire-protection-rated openings, install frames according to NFPA 80.
        b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch (1.59 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.59 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.59 mm), measured at jambs at floor.

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:
2. Jambs and Head: 1/8 inch (3.18 mm) plus or minus 1/16 inch (1.59 mm).
3. Between Edges of Pairs of Doors: [1/8] inch ([3.18] mm) plus or minus [1/16] inch ([1.59] mm).
4. Between Bottom of Door and Top of Threshold: Maximum [3/8] inch ([9.52] mm).
5. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum [3/4] inch ([19.05] mm).

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (228.6 mm) o.c. and not more than 2 inches (50.8 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

This page intentionally left blank

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Solid-core doors with wood-veneer faces.

B. Factory fitting flush wood doors to frames and factory machining for hardware.

C. Shop finishing flush wood doors.

1.3 REFERENCE STANDARDS

A. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings. Include shop-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Requirements for veneer matching.
   6. Doors to be shop finished and finish requirements.

C. Samples for Verification:
   1. For each wood species and transparent finish, provide set of three samples, approximately 8 x 10 inches, showing typical range of color and grain to be expected in finished Work.
   2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Eggers Industries.
   2. Graham Wood Doors; ASSA ABLOY Group company.
   3. Masonite (formerly Marshfield-Algoma)
   4. Oshkosh Door Company.
   5. VT Industries Inc.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S. 1A, "Architectural Wood Flush Doors."
   1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
   2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits, and where indicated.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors :
   1. Grade: Custom (Grade A faces).
   2. Species: Select white maple.
   3. Cut: Plain sliced (flat sliced).
      a. Match between Veneer Leaves: Book match.
   4. Assembly of Veneer Leaves on Door Faces: Balance match.
   5. Pair and Set Match: Provide for doors hung in same opening.
      a. Transom Match: Continuous match.
   6. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
   7. Core: Structural composite lumber.
      a. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
   8. WDMA I.S. 1A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: Flush rectangular beads .

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be shop finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

D. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

2.6 SHOP FINISHING

A. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Transparent Finish:
   1. Transparent Finish:
   2. Grade: Custom.
   3. Finish: WDMA TR-6 catalyzed polyurethane.
   4. Staining: As selected by Architect from manufacturer's full range.
   5. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
   6. Sheen: Satin.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Exterior storefront systems.

1.3 REFERENCE STANDARDS

A. AA (Aluminum Association) – Designation System for Aluminum Finishes.

B. AAMA Series number 11 – Design Wind Loads for Buildings and Boundary Layer Wind Tunnel Testing.

C. AAMA 101 – Standard Specification for Window, Doors, and Skylights.

D. AAMA 200 – Standard Practice for the Installation of Windows with Frontal Flanges for Surface Barrier Masonry Construction.

E. AAMA 502-08 – Voluntary Specification for field Testing of Newly Installed Fenestration Products.

F. AAMA 511 – Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products

G. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

H. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

I. AAMA 701/702 – Combined Voluntary Specifications for Pile Weather-stripping and eplaceable Fenestration Weatherseals.

J. AAMA 1503.1 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

K. AAMA 2604 – Voluntary Specification, Performance Requirements and Test Procedure for Superior Performing Organic Coating on Aluminum Extrusions and Panels.

L. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedure for Superior Performing Organic Coating on Aluminum Extrusions and Panels.

M. ASCE 7 – Minimum Design Loads for Buildings and other Structures.

N. ASTM A123/A123M – Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and steel products.

O. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

P. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

Q. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

R. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.

S. ASTM D2287 – Standard Specification for Non-Rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.

T. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage.

U. Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.

V. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

W. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

X. 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.

Y. ASTM F588 – Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

Z. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
   2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples: For units with factory-applied finishes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   3. Expansion provisions.
   4. Glazing.
   5. Flashing and drainage.

E. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design requirements signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Energy Performance Certificates: For glazed storefront systems, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each glazed storefront system.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

D. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed storefront systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum storefront and entrance systems that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

D. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

E. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

F. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
   1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

G. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
   1. Provide NFRC-certified glazed aluminum storefront systems with an attached label.

H. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.9 MOCK-UPS

A. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

B. Build mockup of typical wall area as indicated by the Architect.

C. Field testing shall be performed on mockup according to requirements in "Field Quality Control" Article.

D. Approval of mockup does not constitute approval of deviations from the Contract Documents contained in mockup unless Architect specifically approves such deviations in writing.

E. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRE-INSTALLATION MEETING

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

B. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

C. Review and discuss the finishing that is required to be coordinated with the finishing of other aluminum work for color and finish matching.

D. Review, discuss, and coordinate the interrelationship with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.

E. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

F. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.11 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.12 WARRANTY

A. Warranty: Standard form in which manufacturer and installer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Adhesive or cohesive sealant failures.
      e. Water leakage through fixed glazing and framing areas.
      f. Failure of operating components.
   2. Warranty Period for installer: Two (2) years from date of Substantial Completion.
   3. Warranty Period for manufacturer: Five (5) years from date of Substantial Completion.

1.13 MAINTENANCE SERVICE

A. Entrance Door Hardware:
   1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

1.14 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glazing-to-glazing contact.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.

B. Structural Loads:
   1. Wind Loads: Basic wind speed, importance factor and exposure category shall be as indicated on Structural Drawings.

C. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches and shall also comply with the impact certification requirements.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller and shall comply with the impact certification requirements.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
   1. Wind Loads: Basic wind speed, importance factor and exposure category shall be as indicated on drawings.
   2. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches or 3/4".

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas to comply with manufacturers testing of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

G. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
   2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
      a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
      b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
      c. Interior Ambient-Air Temperature

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45.

J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
   2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
   3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

K. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
   1. Sound Transmission Class (STC): Minimum 32 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413 and ASTM E 1332.

L. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated if design exceeds limitations of the impact certification and provide additional elements as required to meet design loads.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Kawneer.
      a. Basis of Design Products:
         1) Frame: "Trifab® VersaGlaze® 451T Framing System."
         2) Doors: "500 Standard" Swing Door.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. YKK
   2. EFCO.

C. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Glazing System: Retained mechanically with gaskets on four sides.
   2. Glazing Plane: Center.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.

D. Anchors: Three-way adjustable anchors with minimum adjustment of that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.3 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: Fabricate from extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
    a. Provide nonremovable glazing stops on outside of door and frame.

2.4 ENTRANCE DOOR HARDWARE

A. Opening-Force Requirements:
    1. Latches and Exit Devices: Not more than 5 lbf required to release latch.

B. Weather Stripping: Manufacturer's standard replaceable components.
    1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
    2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

D. Silencers: BHMA A156.16, Grade 1.

E. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

F. Drip Edge: Provide drip cap at all exterior door frames exposed to the elements with no building overhangs to keep rain from hitting the door.
    1. Drip Cap: Drip #346 with clear anodized finish as manufactured by Pemko.
        a. Manufacturer is as indicated however equal or better performing products of other manufacturers will be considered for acceptance by the Architect.

2.5 GLAZING SYSTEMS

A. Glazing: As specified in specification section “Glazing”.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: As recommended by manufacturer for joint type.
    1. Color: As selected by Architect from manufacturer's full range of colors.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Specification Section "Joint Sealants".

B. Bituminous Paint: Cold-applied, non-fibered asphalt emulsion complying with ASTM D1227, Type 2 requirements formulated for 30-mil (0.762-mm) thickness per coat.

2.7 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
    2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
    3. Extruded Structural Pipe and Tubes: ASTM B 429.
    4. Structural Profiles: ASTM B 308/B 308M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.8 SILL PAN AT EXTERIOR STOREFRONT

A. Provide .125 inch aluminum sill pan with 1/4" upturn at inside edge.

B. Finish shall match storefront system.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors, provide compression weather stripping at fixed stops.

D. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At pairs of exterior doors provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. At exterior doors provide weather sweeps applied to door bottoms.

E. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

B. Aluminum Surfaces: Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

E. Bronze Anodic Finish: Mechanical Finish, nonspecular as fabricated Chemical Finish, etched Anodic Coating, clear coating 0.7mils or thicker complying with AAMA 612. Complying with paint manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces.

F. All aluminum fenestration components will have a clear anodic finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer’s written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

C. Corrosion Protection: Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

E. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

F. Sill Pan Installation: Install sill pan in full bed of sealant on concrete slab prior to installing system.

G. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

H. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

I. Install perimeter joint sealants as specified in specification section "Joint Sealants" to produce weathertight installation.

J. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping. Indicate entrance door hardware mounting heights on Drawings or insert in subparagraph below.
   1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

K. Install glazing as specified in specification section "Glazing."

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 10 feet; 1/4 inch over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
3. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas of glazed aluminum framed assemblies shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

C. Test Area:
1. One bay area and four windows, but not less than 30 feet, by one story of glazed aluminum framed assemblies.
2. Perform a minimum of two tests in areas as directed by Architect.

D. Test Types:
1. Air Infiltration: Areas shall be tested for air leakage as indicated on manufacturers test of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
3. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

E. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Aluminum framed assemblies will be considered defective if they do not pass tests and inspections.

H. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.6 EPHA CERTIFICATIONS

A. Certification shall be provided that installation in the hurricane hardened areas is in compliance with all hurricane hardened requirements.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
4. Division 08 Sections:
   a. "Hollow Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Aluminum-Framed Entrances and Storefronts"
   d. “Automatic Door Operators"
5. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
6. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware

3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.

b. Catalog pages for each product.
c. Final approved hardware schedule edited to reflect conditions as installed.
d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.

b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) Schlage ND Series: 10 years
        2) Exit Devices
            a) Von Duprin: 10 years
        3) Closers
            a) LCN 4000 Series: 30 years

4) Automatic Operators
   a) LCN: 2 years

b. Electrical Warranty
   1) Exit Devices
      a) Von Duprin: 3 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. McKinney TB series
   b. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select
   b. Roton

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. Securitron CEPT-10
   b. Security Door Controls PTM

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage ND series

2. Acceptable Manufacturers and Products:
   a. Sargent 11-Line
   b. Corbin-Russwin CL3100 series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
   a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
   b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
   c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
   d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
   e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Lever Design: RHO

2.08 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Detex Advantex series
   b. Precision APEX 2000 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.09 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 6000 Series

2. Acceptable Manufacturers and Products:
   a. Folger Adam 300 Series
   b. HES 1006 Series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.10 PASSIVE INFRARED MOTION SENSORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage SCAN II Series

2. Acceptable Manufacturers and Products:
   a. Securitron XMS Series
   b. Security Door Controls MD-31D Series

B. Requirements:

1. Provide motion sensors as specified in hardware groups.

2.11 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage Everest 29 S

2. Acceptable Manufacturers and Products:

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer’s series as indicated. Refer to “KEYING” article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
   a. Patented Open: cylinder with interchangeable core with open keyway.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.12 KEYING

A. Scheduled System:

1. New factory registered system:
   a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
      4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
      5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
   e. Quantity: Furnish in the following quantities.
      1) Permanent Control Keys: 3.
      2) Master Keys: 6.
      3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
      4) Key Blanks: Quantity as determined in the keying meeting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
   a. Corbin-Russwin DC8000 series
   b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.14 ELECTROMECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN Senior Swing

2. Acceptable Manufacturers and Products:
   a. Stanley Access Technologies M-Force

B. Requirements:

1. Provide low energy automatic operator units that are electromechanical design complying with ANSI/BHMA A156.19.
   a. Opening: Powered by DC motor working through reduction gears.
   b. Closing: Spring force.

c. Manual, hydraulic, or chain drive closers: Not permitted.
d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
e. Cover: Aluminum.

2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 1 to 32 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, and adapters for arms as required to suit details.
4. Provide motion sensors and/or actuator switches, and receivers for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.

2.15 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
a. Ives

2. Acceptable Manufacturers:
a. Burns
b. Trimco

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.16 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
a. Ives

2. Acceptable Manufacturers:
a. Burns
b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.18 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. National Guard
   b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.20 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.21 COAT HOOKS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Rockwood

B. Provide coat hooks as specified.

2.22 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

133964 OPT0427861 Version 1

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 01

For use on Door #(s):
101A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	CONT. HINGE	112HD EPT			628	IVE
2	EA	POWER TRANSFER	EPT10			689	VON
1	EA	RIM CYLINDER	1E72			626	BES
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-EO 24 VDC			626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-NL-OP-388 24 VDC			626	VON
1	EA	PERMANENT CORE	PER FACILITY KEY SYSTEM			626	BES
2	EA	90 DEG OFFSET PULL	8190-O 10"			630	IVE
1	EA	SURF. AUTO OPERATOR	9553 REG2 LESS TRACK AS REQ (120/240 VAC)			ANCL R	LCN
2	EA	ACTUATOR, TOUCHLESS	8310-813			BLK	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS			630	IVE
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS			630	IVE
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	MEETING STILE	8217SBK PSA			BK	ZER
2	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	545A			A	ZER
1	EA	CREDENTIAL READER	BY SECURITY SECTION				
2	EA	DOOR POSITION SWITCH	BY SECURITY SECTION				
1	EA	POWER SUPPLY	BY SECURITY SECTION				

DOOR NORMLLY CLOSED AND LOCKED.
FREE EGRESS AT ALL TIMES BY PUSH PAD.
ACCESS BY VALID CREDENTIAL AT THE READER OR KEY OVERRIDE.
VALID CARD READ WILL ACTIVATE TOUCHLESS ACTUATOR. WAVING AT TOUCHLESS ACTUATOR WILL RETRACE LATCHBOLT AND OPEN DOORS.
DOOR REMAINS LOCKED WITH LOSS OF POWER OR ACTIVATION OF FIRE ALARM (FAIL SECURE).
DOOR MONITORED.

Hardware Group No. 02

For use on Door #(s):
101B

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	CONT. HINGE	112HD EPT			628	IVE
2	EA	POWER TRANSFER	EPT10		✓	689	VON
1	EA	RIM CYLINDER	1E72			626	BES
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-EO 24 VDC		✓	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-NL-OP-388 24 VDC		✓	626	VON
1	EA	RIM CYLINDER	20-057			626	SCH
1	EA	FSIC CORE	23-030			626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"			630	IVE
1	EA	SURF. AUTO OPERATOR	9553 REG2 LESS TRACK AS REQ (120/240 VAC)		✓	ANCL R	LCN
2	EA	ACTUATOR, TOUCHLESS	8310-813		✓	BLK	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS			630	IVE
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	MEETING STILE	8217SBK PSA			BK	ZER
2	EA	DOOR BOTTOM	364AA			AA	ZER
1	EA	CREDENTIAL READER	BY SECURITY SECTION				
2	EA	DOOR POSITION SWITCH	BY SECURITY SECTION		✓		
1	EA	POWER SUPPLY	BY SECURITY SECTION				

DOOR NORMLLY CLOSED AND LOCKED.
FREE EGRESS AT ALL TIMES BY PUSH PAD.
ACCESS BY VALID CREDENTIAL AT THE READER OR KEY OVERRIDE.
VALID CARD READ WILL ACTIVATE TOUCHLESS ACTUATOR. WAVING AT TOUCHLESS ACTUATOR WILL RETRACE LATCHBOLT AND OPEN DOORS.
DOOR REMAINS LOCKED WITH LOSS OF POWER OR ACTIVATION OF FIRE ALARM (FAIL SECURE).
DOOR MONITORED.

Hardware Group No. 03

For use on Door #(s):
102 103 109

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	HOSPITAL PRIVACY W/ OUTSIDE INDICATOR	ND44S RHO OS-OCC		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 04

For use on Door #(s):
104A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
8	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	RIM CYLINDER	1E72		626	BES
1	EA	PANIC HARDWARE	9949-EO		626	VON
1	EA	PANIC HARDWARE	9949-L-NL-06		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETING STILE	8217SBK PSA		BK	ZER

Hardware Group No. 05

For use on Door #(s):
104B 112A 112B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112HD EPT		628	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	DELAYED PANIC HARDWARE	CX98-EO 24 VDC		626	VON
1	EA	MORTISE CYLINDER	20-061		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER
1	EA	DOOR POSITION SWITCH	BY SECURITY SECTION			
1	EA	POWER SUPPLY	BY SECURITY SECTION			

DOOR NORMALLY CLOSED AND LOCKED.
DELAYED EGRESS LOCKING SYSTEM - DEPRESSING PUSHBAR OF PANIC DEVICE FOR DESIGNATED AMOUNT OF TIME BEGINS IRREVERSIBLE ALARM CYCLE. UPON COMPLETION OF ALARM CYCLE FREE EGRESS IS ALLOWED. DEVICE CAN BE ARMED, RESET OR DISARMED BY ACCESS CONTROL SYSTEM OR MORTISE CYLINDER IN PANIC DEVICE.
DELAYED EGRESS SYSTEM UNLOCKS UPON ACTIVATION OF FIRE ALARM OR POWER LOSS ALLOWING EMERGENCY FREE EGRESS.

Hardware Group No. 06

For use on Door #(s):
105

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB358/FB458 AS REQ'D	US26D	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
2	EA	OH STOP	90S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 07

For use on Door #(s):
106A 106B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND55TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 08

For use on Door #(s):
107A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND55TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 09

For use on Door #(s):
107B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO			626	SCH
1	EA	PERMANENT CORE	PER FACILITY KEY SYSTEM			626	BES
1	EA	ELECTRIC STRIKE	6400 FSE 12/24 VAC/VDC		✓	630	VON
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	142AA			AA	ZER
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	DOOR BOTTOM	364AA			AA	ZER
1	EA	THRESHOLD	545A			A	ZER
1	EA	CREDENTIAL READER	BY SECURITY SECTION				
1	EA	DOOR POSITION SWITCH	BY SECURITY SECTION		✓		
1	EA	MOTION SENSOR/REX	BY SECURITY INTEGRATOR		✓	BLK	SCE
1	EA	POWER SUPPLY	BY SECURITY SECTION				

DOOR NORMALLY CLOSED AND LOCKED.
FREE EGRESS AT ALL TIMES.
ACCESS BY VALID CREDENTIAL OR KEY OVERRIDE.
DOOR REMAINS LOCKED WITH LOSS OF POWER OR SIGNAL FROM FIRE ALARM SYSTEM (FAIL SECURE).
DOOR MONITORED.

Hardware Group No. 10

For use on Door #(s):
108 114A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 11

For use on Door #(s):
110

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND55TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 12

For use on Door #(s):
111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 13

For use on Door #(s):
113

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

133964 OPT0427861 Version 1

Legend:
↯Electrified Opening

Door#	HwSet#
101A↯	01
101B↯	02
102	03
103	03
104A	04
104B↯	05
105	06
106A	07
106B	07
107A	08
107B↯	09
108	10
109	03
110	11
111	12
112A↯	05
112B↯	05
113	13
114A	10

END OF SECTION

SECTION 08 71 13 - AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. In-ground, low energy door operators for swinging doors.

B. Related Sections:
   1. Division 7 Sections for caulking to the extent not specified in this section.
   2. Division 8 Section “Aluminum-Framed Entrances and Storefronts” for entrances furnished separately in Division 8 Section.
   3. Division 8 Section “Door Hardware” for hardware to the extent not specified in this Section.
   4. Division 26 and 28 Sections for electrical connections including conduit, liquid- tight connections, and wiring for automatic entrance door operators and access control devices.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. BHMA A156.10 - Power Operated Pedestrian Doors; 2017.

D. BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors; 2019.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

H. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

J. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.

K. ANSI/BHMA A156.19 for power assist and low energy door applications.

L. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

M. NFPA 105 - Installation of Smoke Door Assemblies.

N. American Association of Automatic Door Manufacturers (AAADM).

O. National Association of Architectural Metal Manufacturers (NAAMM) - Metal Finishes Manual for Architectural Metal Products..

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Activation Device.
      a. Knowing act.

2. Safety Device.
3. Double Egress Doors.

1.6 ACTION SUBMITTALS

A. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design requirements signed and sealed by the qualified South Carolina registered professional engineer responsible for their preparation.

B. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.

C. Shop Drawings: Submit manufacturer’s shop drawings, including elevations, sections and details, indicating dimensions, materials, operator, motion /presence sensor control device, anchors, hardware, finish, options and accessories.
   1. Indicate required clearances, and location and size of each field connection.
   2. Indicate locations and elevations of entrances showing activation and safety devices.
   3. Wiring Diagrams: For power, signal, and activation / safety device wiring.

D. Samples: Submit manufacturer’s samples of aluminum finish.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of automatic entrance. Include emergency-exit features of automatic entrances serving as a required means of egress.

C. Product Test Reports: For each type of automatic entrance, for tests performed by a qualified testing agency.

D. Manufacturers Field Reports: Submit manufacturer’s field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA after completion of installation.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the work of this section in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the operators and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.8 PREINSTALLATION MEETINGS

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

B. Pre-installation Dimension Check: Field verify dimensions prior to manufacturing door.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For automatic entrances, safety devices, and control systems to include in operation and maintenance manuals.

1.10 QUALITY ASSURANCE

A. Power-Operated Door Standard: BHMA A156.10.

B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 10 years of documented experience in manufacturing of doors and equipment of similar to that indicated for this Project and that have a proven record of successful in-service performance. Manufacturer to have a company certificate issued by AAADM.

C. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing and maintenance of units similar in material, design,

and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Certified Inspector Qualifications: Certified by AAADM.

E. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.
   1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
   2. NFPA 101 - Life Safety Code.

F. Source Limitations for Automatic Door Operators: Obtain each type of door operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.
   1. Operator shall be furnished complete with the cement case, case cover and drive mechanism from a single manufacturer.

G. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.
   1. ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Operated Doors.
   2. NFPA 101 - Life Safety Code.

H. 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.

I. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

J. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

K. Delegated-Design: Provide design services, calculations and shop drawings for delegated design requirements complying with code requirements, performance requirements and design criteria signed and sealed by an engineer registered in the State of South Caroli.

1.11 FIELD CONDITIONS

A. Coordinate door operators with doors, frames and related work to ensure proper size, thickness, hand, function and finish. Coordinate hardware for automatic entrances with hardware required for rest of the project.

B. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control automatic entrances if applicable. Concrete, reinforcement and formwork are specified in Division 03.

C. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies and access control system as applicable.

D. Templates: Distribute for doors, frames, and other work specified to be factory prepared for installing automatic entrances.

1.12 PERFORMANCE REQUIREMENTS

A. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the loads and stresses within limits and under conditions indicated according to ASCE 7.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes with temperature changes 120 deg F, ambient; 180 deg F, material surfaces.

C. Opening Force Requirements:
   1. Power-Operated Doors: In case of power loss, door needs to open per applicable codes.
   2. Opening Force Requirements for Egress Doors: In the event of power failure to the operator, swinging automatic entrance doors shall open with a manual force, not to exceed 30 lbf. to

set the door in motion, and 15 lbf. to fully open the door, applied at 1" from the latch edge of the door.

3. Entrapment-Prevention Force: The force required to prevent a stopped door from opening or closing shall not exceed 15 lbf (67 N) measured 1" (25 mm) from the latch edge of the door at any point during opening or closing.
4. Breakaway Device for Power-Operated Doors: Not more than 50 lbf. required for a breakaway door or panel to open.

D. Closing Time:
1. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 3 seconds or longer as applicable per ANSI/BHMA A156.19 standards.
2. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.

1.13 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Automatic Door Operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.

D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.

E. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a.
b. Faulty operation of operators, controls, and hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

F. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
1. Warranty Period: Ten (10) years from date of Substantial Completion.
a. Verify available special finish warranties with manufacturers. Extended 20-year finish warranties are sometimes available for 70 percent fluoropolymer coatings.
2. Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
1. ASSA ABLOY Entrance Systems (Besam ASSA ABLOY), 1900 Airport Road, Monroe, NC 28110. Toll Free (877) SPEC-123. Fax (704) 290- 5555 Website www.assaabloyentrance.com

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, as indicated below:
   1. Extruded Aluminum, Alloy 6063-T5.

2.3 SWING DOOR OPERATORS

A. Basis of Design Product: "SW200i-IG" in-ground, low energy automatic door operator.
   1. Automatic door equipment accommodates medium to heavy pedestrian traffic.
   2. Reference Standard: ANSI/BHMA A156.19.
   3. Configuration: Operator to control single swinging doors and pairs of swinging doors as indicated on the drawings and specified below:
      a. Traffic Pattern: One way.
      b. Single leaf operation.
      c. Double Egress: Simultaneous swing.
   4. Automatic Door Operator: Electro-mechanical, non-handed operator, powered by 24 volt, 1/4 hp motor. Operator shall be adjustable to compensate for different manual push forces as required.
      a. Automatic operator shall be capable of operating and controlling up to a 700 pound (317.5 kg) door, 48 inches (1219.2 mm) in width.
      b. In-Ground Operator Enclosure and Drive Unit:
         1) Cement case shall be 12 gauge minimum thickness steel, fully welded enclosure.
            (a) Corrosion Protection: 6 to 10 mill powder coat finish suitable for continuous protection when in contact with concrete and masonry.
         2) Removable top case cover shall be 12 gauge minimum thickness steel with powder coat finish.
            (a) Cover shall be sealed to cement case by a neoprene gasket.
            (b) All penetrations including the operator drive shaft shall have seals to prevent water and moisture infiltration.
         3) Drive Mechanism Assembly: Manufacturer's drive mechanism assembly designed to provide swing door operation from an in-ground automatic door operator.
            (a) Operator shaft shall be directly coupled to the pivot assembly.
            (b) Weight of door shall be fully supported independently through a pivot bearing support. Door weight shall not be supported by the operator or the gear box assembly.
         4) Connecting hardware to door shall be a door arm attached to the bottom rail of the swing door.
            (a) Output shaft adapter and door arm shall allow for butt hinge installation.
            (b) Top pivot assembly shall be supplied by the operator manufacturer.
      c. Operator Temperature Range: Capable of operating within temperature ranges of -31° F to 160° F (-35° C to 71° C).
      d. Electrical Characteristics: Maximum power consumption is 300 watts (2.5 amps at 120 VAC), 50/60hz, built-in thermal overload protection.
   5. Door Operation:
      a. Opening Cycle The adjustable speed operator mechanically powers the drive shaft and the torque control maintains constant speed throughout the opening cycle regardless of stack pressures or wind speed. Operator shall allow manual door operation with operational forces as indicated to fully open the door applied at 1" 0.98 inch (25 mm) from the latch edge of the door.
         1) Manual push force shall be adjustable from 5 lbf to 15 lbf maximum.

b. Hold Open: The operator shall stop and hold the door open at the selected door opening angle for an adjustable period of time (1.5 seconds to 30 seconds).
c. Closing Cycle: Spring close with speed controlled power assist.
    1) Upon loss of power, dynamic braking will control the door insuring controlled closing.
    2) Selectable Torque Control: Automatically adjusts torque without changing the closing speed of the operator.
        (a) When the torque control is activated, the closing speed shall remain constant regardless of stack pressures or wind speed.
        (b) Torque Cancellation: The torque control is deactivated whenever there is a signal received from door mounted sensors.
        (c) The torque control is disabled during manual use of the door.
d. Wind Force Dampening: The operator electromechanically counteracts wind forces, slowing down the door movement to safely open or close the door.
e. Stack Pressure Compensation: Operator shall counteract positive stack pressures, negative stack pressures, and sudden changes of stack pressures. The operator never allows the door to open or close faster than the speed control settings, regardless of pressures.
f. Obstruction Control: The operator will stop and reverse the door movement.
g. Electric Lock Management:
    1) Internal module for electrified locking integration.
    2) Electric Lock Output: Selectable 12 VDC, maximum 1200 mA / 24 VDC, maximum 600 mA.
    3) Lock monitoring prevents operator(s) from opening door(s) until release of electrified lock.
    4) Operator pulls door closed before opening, automatically unjamming electric latch hardware.
    5) Sequenced operation between operators for pairs of doors allowing lock release and astragal coordination.
h. Lock Retry Circuit: If attempt to fully close the door is unsuccessful, the operator will automatically reverse open 10 degrees and reclose in an attempt to successfully close the door.
i. Selectable Alarm Reset: The operator can be field set so that after receiving an alarm signal, the operator will not accept any activation impulses and will operate only as a manual door closer until manually reset.
j. Electronic Controls: Solid state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. The controls include time delay (1 to 30 seconds) for normal cycle.
k. Control Switch: Automatic door operators shall be equipped with the following type of multi-position function switch:
    1) 4 position rotary switch remotely mounted (On-Off-Hold- Special Function).

6. Operator Interface:
    a. Safety Sensor Integration for overhead presence safety device and door mounted reactivation safety sensors.

2.4 ACTIVATION BY SMOKE EVACUATION SYSTEM

A. General: Provide activation by the smoke evacuation system and/or fire detection system. Coordinate other required activation devices and safety devices with door operation and door operator mechanisms.

B. Activation: Smoke evacuation system and/or fire detection system shall provide activation of the operator by means of a normally open maintained contact to control the opening and closing of

the door systems in the event of an alarm condition. Doors are to be held open until the smoke evacuation/fire detection system is reset.

2.5 ACTIVATION DEVICES

A. General: Provide activation devices in accordance with ANSI/BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Knowing Act Activation Device:
   1. Push Plate: Hard wired, 6 inch round stainless steel push plate switches engraved with "Push to Open" with a blue handicap logo.

C. Manual Operation: Manual door operation is a standard feature of the door operator.
   1. Operator shall allow manual door operation with operational forces adjustable from 5 lbf to 15 lbf maximum.
   2. Operator shall provide power assist function to the doors to provide ease of manual operational forces.
      a. Manual push force shall be adjustable from 5 lbf to 15 lbf maximum.
   3. Operator shall provide “push and go” operation allowing door to open automatically after activation by manually pulling or pushing on the door.

2.6 SAFETY DEVICES

A. General: Provide safety devices in accordance with ANSI/BHMA A156.10 standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate safety devices with door operation and door operator mechanisms.

B. Safety Devices:
   1. Door Mounted Presence Sensor (DMPS): Shall be the ASSA ABLOY door mounted infrared presence safety device (mounted at top of each door); adjustable to provide detection field sizes and functions required by ANSI/BHMA A156.10.
      a. Unit to provide detection during the travel of the door.
      b. Upon detection the sensor shall provide a signal to stop or reverse the door action.
   2. Door Mounted Safety Sensor Devices: Safety sensor devices shall be door mounted as specified.
      a. The door mounted safety sensor devices shall be mounted on both the swing (pull) side and the approach (push) side of the door (2 safety sensors per leaf), providing detection on both sides of the door.
      b. Power transfer from the door mounted safety sensor to operator shall be through an exposed door cord

2.7 FLOOR PLATE

A. Floor Plate/Threshold: Manufacturer’s standard threshold as indicated.
   1. 1/4 inch (6.35 mm) high ADA compliant aluminum threshold extending the width of the door opening.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance of swinging power operated doors.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.
   1. Verify that all electrical penetrations into the cement case enclosure have liquid tight fittings.

2. Water-test electrical conduit penetrations (high volt and low volt connections) in cement case to assure leak-free system.

C. Proceed only after such discrepancies or conflicts have been resolved.

3.2 INSTALLATION

A. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Operators: Install automatic door operators plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
1. Install in-ground operator housing in accordance with manufacturer's instructions and reviewed shop drawings.
2. Install operator drive mechanism assembly in accordance with manufacturer's instructions.
3. Adjust operator and drive mechanism to achieve smooth operation including back-check, latch, and proper limit stops.
4. Install exposed to view fittings using concealed fasteners where possible.
5. Install threshold and operator fittings per manufacturer's instructions.

C. Door Operators: Connect door operators to electrical power distribution system including smoke evacuation system and/or fire detection system as specified in Division 26 Sections.

D. Sealants: Comply with requirements specified in division 7 Section "Joint Sealants" to seal between the operator housing and the adjacent surfaces and provide a water-tight closure.

E. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.19 and manufacturers installation instructions.

3.3 ADJUSTING

A. Adjust automatic door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA A156.19.

3.4 FIELD QUALITY CONTROL

A. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA A156.19. Certified technician shall be approved by manufacturer.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by automatic door operator installation.

B. Clean metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages and finish to match original finish.

3.6 DEMONSTRATION

A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Glass products.

B. Insulating glass.

C. Glazing sealants.

D. Glazing tapes.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

C. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Glass Manufacturers.
   2. Glass Thicknesses.
   3. Interspace.

1.6 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review temporary protection requirements for glazing during and after installation.

1.8 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (304.8 mm) square.
   1. Tinted glass.

2. Coated glass.
3. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.9 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer .

B. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.
1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Preconstruction adhesion and compatibility test report.

D. Sample Warranties: For special warranties.

1.10 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1.11 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.13 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees Fahrenheit (4.44 degrees Celsius).

1.14 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to

maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace
1. insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
2. Warranty Period: 10 Insert number years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent within specified warranty period. Coverage for any other cause is excluded.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
1. Design Wind Pressures: As indicated on Drawings.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with
1. 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass,
1. heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated,

provide heat-strengthened float glass or fully tempered float glass as needed to comply with"Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Guardian Glass; SunGuard.
      b. Pilkington North America.
      c. Vitro Architectural Glass (formerly PPG).
      d. Old Castle BuildingEnvelope

B. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Guardian Glass; SunGuard.
      b. Pilkington North America.
      c. Vitro Architectural Glass (formerly PPG)
      d. Old Castle BuildingEnvelope.
   2. Coating: Low E.
      a. Color: Light Bronze tint, not reflective.

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

D. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
   1. Perimeter Spacer: Manufacturer's standard spacer material and construction .

2.6 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Glazing Sealant: Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:
   1. Elastomeric material with Shore A durometer hardness of 85, plus or minus 5.

D. Spacers:
   1. Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks:
   1. Elastomeric material of hardness needed to limit glass lateral movement (side walking) with Shore A durometer hardness per manufacturer's written instructions.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 degrees Fahrenheit (48.89 degrees Celsius) , ambient; 180 degrees Fahrenheit (82.22 degrees Celsius) , material surfaces???Insert temperature change???.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Gypsum board.

B. Partition framing systems.

C. Tile backing panels.

D. Cementitious board.

E. Ceiling suspension systems.

F. Accessories necessary for a complete installation.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

G. ASTM C834 - Standard Specification for Latex Sealants; 2017.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

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; 2018.

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; 2020.

K. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

L. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

M. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

N. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

P. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation; 2009 Edition, March 1, 2009

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

R. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

S. ASTM E413 - Classification for Rating Sound Insulation; 2022.

T. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.

U. ASTM E1190 - 2021 Edition, November 15, 2021 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members; 2021 Edition, November 15, 2021.

V. ASTM F1267 - Standard Specification for Metal, Expanded, Steel; 2018 (Reapproved 2023).

W. ASTM C1396/C1396M

X. ASTM C840

Y. Federal Specification SS-L-30D Grade X Type III.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Submit For each type of drywall including calculations for loadings and stresses of exterior walls and specially fabricated framing based on manufacturer's load tables.

B. Shop Drawings: Indicate locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of work.

C. Samples:
   1. Trim Accessories: Full size Sample in 12 inch (300 mm) long length for each trim accessory indicated.
   2. Textured Finishes: 12 inch by 12 inch (300 mm by 300 mm) for each textured finish indicated and on same backing indicated for work.

D. Calculations: Submit calculations verifying steel partition stud minimum base metal thickness and depth compliance with Code and ASTM C645 for height, load, and deflection.

1.6 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For steel studs and runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.7 QUALITY ASSURANCE

A. Product manufacturers shall be current members of Steel Stud Manufacturers Association (SSMA).

B. Provide full time quality control over fabrication and erection complying with applicable codes and regulations of government agencies having jurisdiction.

C. Submit manufacturer's storage and product installation instructions.

D. Installer shall submit qualifications demonstrating five (5) consecutive years of installing specified products of similar and equivalent work scope.

E. Regulatory Requirements:
   1. Comply with applicable requirements of building code for interior finishes.
   2. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

F. Single Source Responsibility:
   1. Submit documentation verifying materials and components are from single manufacturer.
   2. Framing Members: Obtain steel framing members from single manufacturer.
   3. Panel Products: Obtain each type of gypsum board and other panel products from single manufacturer.
   4. Finishing Materials: To the extent possible, obtain finishing materials from same manufacturer supplying gypsum board products. When not possible, obtain materials from manufacturer acceptable to gypsum board manufacturer.

1.8 PREINSTALLATION MEETINGS

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Notify manufacturer of damaged materials received prior to installing.

C. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and potential causes of damage.

D. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 for gypsum board manufacturer's written instructions, whichever are more stringent.
   1. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.

B. Room Temperatures: Maintain minimum 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board, maintain minimum 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

D. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.11 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Comply with manufacturer's load tables and the following design pressures and deflections:
   1. Ground Floor Lobbies: 1/120 at 15 psf.
   2. Partitions Receiving Stone Cladding, Lath and Plaster, or Plaster Veneer: 1/360 at 15 psf.
   3. Partitions Receiving Monitors, Televisions, Heavy Audio/Visual Equipment: 1/360 at 15 psf.
   4. Typical Partitions: 1/240 at 5 psf.
   5. Other Partitions: 1/240 at 5 psf.
      a. Maximum Deflection:
         1) L/240 at 5 lbf per sq. ft.
         2) L/120 at 5 lbf per sq. ft.
         3) L/120 at 7.5 lbf per sq. ft.
         4) L/120 at 10 lbf per sq. ft.

B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

D. Design steel in accord with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

E. Design loads: 5 PSF minimum design lateral load is required for interior walls by building code.

F. Framing systems for interior non-load bearing walls shall withstand design loads for lateral deflections less than L/240.

G. Framing system to accommodate deflection of primary building structure and construction tolerances.

H. Framing shall conform to manufacturer’s load charts and height limitations and shall be designed to accommodate special loading conditions such as point loads, eccentric loads, etc.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.

1. Steel Studs and Tracks:
    a. ClarkDietrich: www.clarkdietrich.com.
    b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
        1) Marino/Ware, Inc.
        2) CEMCO: www.cemcosteel.com.
        3) MBA Building Supplies: www.mbastuds.com.
        4) Custom Stud, Inc.: www.customsteelcraft.com.
        5) MRI Steel Framing, LLC: www.mristeelframing.com.
        6) Phillips Manufacturing Co.: www.phillipsmfg.com.
        7) Steel Network, Inc. (The): www.steelnetwork.com.
        8) Telling Industries: www.tellingindustries.com.
2. Ceiling Suspension System:
    a. Armstrong World Industries, Inc.: www.armstrongceilings.com.
    b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
        1) USG Corporation: www.usg.com.
3. Gypsum Board:
    a. National Gypsum Company: www.nationalgypsum.com.
    b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
        1) Certainteed Corporation: www.certainteed.com.
        2) Continental Building Products.
        3) Georgia Pacific: www.gp.com.
4. Tile Backer Board:
    a. USG Corporation: www.usg.com.
    b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:

1) National Gypsum Company.

5. Cementitious Board:
   a. Custom Building Products: www.custombuildingproducts.com.
   b. National Gypsum Company: www.nationalgypsum.com.
   c. USG Corporation: www.usg.com.
6. Trim:
   a. Fry Reglet Corporation: www.fryreglet.com.
   b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
      1) Gordon, Inc.: www.gordon-inc.com.
      2) Schluter Systems: www.schluter.com.
      3) Pittcon Industries: www.pittconindustries.com.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 MATERIALS

A. Framing Members: ASTM C754 for component sizes and conditions under specified maximum deflection and lateral loading conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C645 requirements for metal.

B. Steel Framing Components: ASTM C754 for conditions indicated; hot dip galvanize complying with ASTM A653/A653M Z180.
   1. Steel Studs and Runners: ASTM C645, 0.0179 inch (0.45 mm) minimum base metal thickness; depth indicated on Drawings.
   2. Dimpled Steel Studs and Runners: ASTM C645, equivalent to minimum base metal thickness indicated on Drawings for depth indicated on Drawings.
   3. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
   4. Cold-Rolled Channel Bridging: 0.0538 inch (1.37 mm) bare steel thickness, with minimum 1/2 inch (12.7 mm) wide flanges; depth indicated on Drawings.
   5. Clip Angle: Not less than 1-1/2 inches by 1-1/2 inches (38.1 mm by 38.1 mm), 0.068 inch (1.73 mm) thick, galvanized steel.
   6. Hat Shaped, Rigid Furring Channels: ASTM C645; 0.0179 inch (0.45 mm) minimum base metal thickness; depth indicated on Drawings.
   7. Resilient Furring Channels: 1/2 inch (12.7 mm) deep, steel sheet members designed to reduce sound transmission. Configuration: Asymmetrical or hat shaped.
   8. Cold Rolled Furring Channels 0.0538 inch (1.37 mm) bare steel thickness, with minimum 1/2 inch (12.7 mm) wide flanges.
      a. Depth: As indicated on Drawings.
      b. Furring Brackets: Adjustable, corrugated edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
      c. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.0625 inch (1.59 mm) diameter wire, or double strand of 0.0475 inch (1.21 mm) diameter wire.
   9. Z-Shaped Furring Channels: With slotted or non-slotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
   10. Auxiliary Framing Materials: Fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
   11. Slip Type Head Joints: Where indicated, provide one of the following:
      a. Single Long Leg Runner System: ASTM C645 top runner with 2 inch (50.8 mm) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into

top runner and with continuous bridging, located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

b. Double Runner System: ASTM C645 top runners, inside runner with 2 inch (50.8 mm) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

c. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
3) Superior Metal Trim; Superior Flex Track System (SFT).

C. Ceiling Suspension System:

1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   a. Armstrong World Industries, Inc.
      1) Type: Drywall Grid Systems.
   b. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
      1) Drywall Suspension System manufactured by USG Corporation.
      2) 640-C manufactured by Chicago Metallic Corporation.
2. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.0625 inch (1.59 mm) diameter wire, or double strand of 0.0475 inch (1.21 mm) diameter wire.
3. Hanger Attachments to Concrete:
   a. Anchors: Post-installed, chemical anchor or post-installed, expansion anchor fabricated from corrosion resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488/E488M by an independent testing agency.
   b. Powder Actuated Fasteners: Suitable for application indicated, fabricated from corrosion resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.
4. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.162 inch (4.12 mm) diameter.
5. Carrying Channels: Cold rolled, commercial steel sheet with base metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2 inch (12.7 mm) wide flanges. Depth indicated on Drawings.
6. Furring Channels (Furring Members):
   a. Cold Rolled Channels: 0.0538 inch (1.37 mm) bare steel thickness, with minimum 1/2 inch (12.7 mm) wide flanges, 3/4 inch (19.1 mm) deep.
   b. Steel Studs: ASTM C645; minimum base metal thickness of 0.0312 inch (0.79 mm); Depth as indicated on Drawings.
   c. Hat Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22.2 mm) deep; Minimum base metal thickness of 0.0312 inch (0.79 mm).
7. Resilient Furring Channels: 1/2 inch (12.7 mm) deep members designed to reduce sound transmission.
8. Grid Suspension System for Ceilings: ASTM C645, direct hung system composed of main beams and cross furring members that interlock.

D. Gypsum Board: ASTM C1396/C1396M, applicable to type of gypsum board indicated and whichever is more stringent.
   1. Wall Board:
      a. Type: X.
      b. Thickness: 5/8 inch (15.9 mm).
      c. Long Edges: Tapered and featured (rounded or beveled) for pre-filling.
   2. Ceiling Board: Manufactured for sag resistance
      a. Type: X typical, C at fire-resistance-rated ceiling assemblies.
      b. Thickness: 1/2 inch (13 mm).
      c. Long Edges: Tapered.

E. Reinforced Gypsum Sheathing (Tile Backer Board): ASTM C1178/C1178M, standard edges. Cellulose fiber reinforced panels may be used in lieu of cementitious board.
   1. Core and Thickness: 5/8 inch (15.9 mm) to match conditions, Type X.
   2. Long Edge: Tapered.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

F. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325.
   1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm) to match conditions.
   2. Long Edges: Standard.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

G. Interior Trim: ASTM C1047; galvanized or aluminum coated steel sheet, rolled zinc, plastic, or paper faced galvanized steel sheet.
   1. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC Bead: J shaped; exposed long flange receives joint compound.
      d. L Bead: L shaped; exposed long flange receives joint compound.
      e. U Bead: J shaped; exposed short flange does not receive joint compound.

H. Expansion (Control) Joint.
   1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
      a. Fry Reglet Corp.
      b. Gordon, Inc.
      c. Pittcon Industries.

I. Continuous Corner Bead.
   1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
      a. Pittcon Softforms LLC.
         1) Type: SO-HSE-90.
         2) Material: Extruded Aluminum; continuous integral fin for surface contact with gypsum board; 7/8 inch (22 mm) wide, tapered to edge; punched with holes staggered to accept screw fastening. Prime with corrosion resistant primer.
   2. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
      a. Fry Reglet Corporation.
      b. Schluter Systems.

J. Joint Treatment: ASTM C475/C475M.

1. Joint Tape:
   a. Exterior Gypsum Soffit Board: Paper.
   b. Joint Compound for Exterior Applications, Glass Mat Gypsum Sheathing Board: Recommended by sheathing board manufacturer.
   c. Joint Tape, Interior Gypsum Board: Paper.
2. Joint Compound:
   a. Gypsum Board: Pre-Filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting type taping compound.
      1) Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting type taping compound.
         (a) Use setting type compound for installing paper faced metal trim accessories.
      2) Fill Coat: For second coat, use setting type, sandable topping compound.
      3) Finish Coat: For third coat, use setting type, sandable topping compound.
      4) Skim Coat: For final coat of Level 5 finish, use setting type, sandable topping compound.
   b. Cementitious Units: Recommended by backer unit manufacturer.
   c. Tile Backing Panels: Recommended by backer unit manufacturer.
   d. Water Resistant Gypsum Backing Board: Use setting type taping compound and setting-type, sandable topping compound.
   e. Joint Compound, Glass Mat Sheathing Board: Recommended by sheathing board manufacturer.

K. Auxiliary Materials: Comply with referenced installation standards and manufacturer's written recommendations.
   1. Steel Drill Screws: ASTM C1002, use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

L. Gypsum Board Sheathing Sealants, Caulk, Tape:
   1. Dow Corning 795 or equivalent; Pecora 895 or equivalent.
   2. Borden HPPG Elmer's siliconized acrylic latex caulk or equivalent.
   3. 2-inch wide 10 x 10 glass mesh tape or equivalent.

M. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Subject to compliance with requirements, provide one of the following:
      a. Sherwin Williams “Powerhouse Siliconized Acrylic Latex Sealant”.
      b. Pecora Corporation “AC-20 FTR”.
      c. USG Corporation “SHEETROCK Acoustical Sealant”.
   2. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E90.
   3. Product has flame spread and smoke developed ratings of less than 25 per ASTM E84.
   4. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

N. Glass Mineral Wool Fiber Acoustical Blanket Insulation
   1. Unfaced, Glass Mineral Wool Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   2. Size: as indicated on drawings.

O. Auxiliary Materials: Comply with referenced installation standards and manufacturer's written recommendations.
   1. Steel Drill Screws: ASTM C1002, use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2.3 FINISHES; PROTECTIVE COATINGS:

A. Standard: ASTM A653/A653M, G40, hot dip galvanized, for interior materials.

B. Enhanced: ASTM A653/A653M, G60, hot dip galvanized, for exterior materials.

C. Galvanized to G60 for interior materials in contact with cementitious materials or other materials that could induce corrosive actions.

D. Touchup Paint: Comply with ASTM A780/A780M-09 (2015): Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

B. Gypsum Board Assemblies: Comply with requirements in ASTM C840 applicable to framing installation.

C. Suspension System: Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
   1. Suspend hangers from building structure:
      a. Install hangers plumb and free from contact with insulation or objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
      b. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
         1) Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
      c. Do not attach hangers to steel roof deck.
      d. Do not attach hangers to permanent metal forms. Furnish cast in place hanger inserts that extend through forms.
      e. Do not attach hangers to rolled in hanger tabs of composite steel floor deck.
      f. Do not connect or suspend steel framing from ducts, pipes, or conduit.
   2. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3. Ceiling Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross furring members to each other and butt cut to fit into wall track.

D. Framing Assembly: Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
   1. Direct Furring: Attach to concrete or masonry with stainless steel screws designed for masonry attachment, or powder-driven fasteners spaced [16] inches ([406.4] mm) o.c.
      a. Furring: [16] inches ([406.4] mm) o.c.
      b. Z-Furring Members:
         1) Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced [16] inches ([406.4] mm) o.c.
         2) At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than [12] inches ([304.8] mm) from corner and cut insulation to fit.
   2. Steel Stud Supported Ceilings and Soffits:
      a. Studs: [16] inches ([406.4] mm) o.c. or as required to meet design loads.
   3. Install studs so flanges within framing system point in same direction. Space studs in single layer application as indicated on drawings.
   4. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
      a. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
         1) Install two studs at each jamb, unless otherwise indicated.
         2) Install cripple studs at head adjacent to each jamb stud, with minimum 1/2 inch (12.7 mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
         3) Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
      b. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   5. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

E. Sound Insulation: Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

F. Gypsum Panels: Comply with ASTM C840. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
   1. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
   2. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
   3. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

4. Cover both faces of support framing with gypsum panels in concealed spaces, except in chases braced internally.
    a. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
    b. Fit gypsum panels around ducts, pipes, and conduits.
    c. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 inch to 3/8 inch (6.4 mm to 9.5 mm) wide joints to install sealant.
5. Isolate perimeter of gypsum board applied to non-load bearing partitions at structural abutments, except floors. Provide 1/4 inch to 1/2 inch (6.4 mm to 12.7 mm) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
6. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Gypsum Board: Install interior gypsum board where indicated on drawings.
1. Single Layer Application:
    a. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
    b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    c. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
2. Multilayer Application:
    a. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
    b. On Z shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
    c. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

H. Provide control joints in gypsum board partitions, bulkheads, ceilings, and soffits as follows:
1. Partition, furring, or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
2. Ceiling or soffit abuts a structural element, dissimilar wall or partition or other vertical penetration.
3. Construction changes within plane of partition or ceiling.
4. Partition or furring run exceeds 30 feet, unless noted otherwise.
5. Ceilings with perimeter relief when dimensions exceeds 50 feet in either direction.
6. Ceilings without perimeter relief when dimensions exceeds 30 feet in either direction.
7. Soffits that exceed 30 feet in length.
8. Exterior soffits exceed 30 feet in either direction.
9. Wings of “L”, “U”, and “T”-shaped ceiling areas are joined.
10. Ceiling between two ends of walls.
11. Top corners of both sides of recessed door entries.
12. Expansion or control joints occur in the exterior wall.

13. Less than ceiling height frames should have control joints extending to the ceiling from both corners. Ceiling height door frames may be used as control joints. Treat window openings in same manner as doors.
14. Control Joint No. 093: Apply over face of gypsum board where specified. Cut to length with a fine-toothed hacksaw (32 teeth per inch). Cut end joints square, butt together, and align to provide neat fit. Attach control joint to gypsum board with fasteners spaced 6 inches o.c. maximum along each flange. Remove plastic tape after finishing with joint compound or veneer finish.
    a. Leave a 1/2 inch continuous opening between gypsum boards for insertion of surface-mounted joint.
    b. Interrupt wood floor and ceiling plates with a 1/2 inch gap, wherever there is a control joint in the structure.
    c. Provide separate supports for each control joint flange.
    d. Provide an adequate seal behind control joint where sound or fire ratings are prime considerations.

I. Provide control joints in walls according to ASTM C840 (30 feet maximum), at each door and window jamb (unless noted otherwise), and in specific locations indicated on Drawings.

J. Backing Panels:
1. Cementitious Backer Units: ANSI A108.11; install where indicated with 1/4 inch (6.4 mm) gap where panels abut other construction or penetrations. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

K. Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Attach trim according to manufacturer's written instructions.
1. Exterior Trim: Install in the following locations:
    a. Cornerbead: Use at outside corners.
    b. LC Bead: Use at exposed panel edges.
2. Interior Trim: Install in the following locations:
    a. Cornerbead: Use at outside corners, unless otherwise indicated.
    b. Bullnose Bead: Use at outside corners.
    c. LC Bead: Use at exposed panel edges.
    d. L Bead: Use where indicated or necessary.
    e. U Bead: Use at exposed panel edges.

L. Gypsum Board Finishing: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
1. Pre-fill open joints, rounded or beveled edges, and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
3. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
    a. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
    b. Level 2: Panels that are substrate for tile.
    c. Level 3: Where indicated on Drawings.
    d. Level 4: For surfaces receiving flat paints.
    e. Level 5: For surfaces receiving gloss or semi-gloss paint, subjected to severe lighting, or receiving wall covering.

M. Installation Tolerances:
1. Suspension System: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

2. Installation Tolerances, Suspension System: Install suspension systems level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

This page intentionally left blank

SECTION 09 30 00 - TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Ceramic tile (CWT-1).
   2. Porcelain tile (PP-1).
   3. Metal edge strips.

1.3 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 – Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, A108.4, A118.1, ANSI A136.1.

B. ANSI A108.1 – Installation of Ceramic Tile with Portland Cement Mortar.

C. ANSI A108.4 – Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A108.5 – Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

E. ANSI A108.6 – Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy.

F. ANSI A108.8 – Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout.

G. ANSI A108.9 – Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

H. ANSI A108.10 – Installation of Grout in Tile work.

I. ANSI A108.13 - Installation of Load-Bearing Bonded Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.

J. ANSI A108.17 – Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone.

K. ANSI A118.1 – Dry-Set Portland Cement Mortar.

L. ANSI A118.3 – Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

M. ANSI A118.4 – Latex-Portland Cement Mortar.

N. ANSI A118.6 – Ceramic Tile Grouts.

O. ANSI A118.8 – Modified Epoxy Emulsion Mortar/Grout.

P. ANSI A118.10 – Load-Bearing Bonded Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.

Q. ANSI A118.12 – Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone.

R. ANSI A136.1 – Organic Adhesive for Installation of Ceramic Tile.

S. ANSI A137.1 – Ceramic Tile.

T. TCNA - Tile Council of North America - Handbook for Ceramic Tile Installation.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Refer to Section 01 42 16 - Definitions for the following terms:
   1. Module Size.
   2. Face Size.

1.6 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples: For tile, grout, and accessories involving color selection.
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches by 36 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
   3. Full-size units of each type of trim and accessory for each color and finish required.
   4. Metal edge strips in 6-inch lengths.

E. Qualification Data: For qualified Installer.

F. Certificates in first paragraph below are issued by manufacturers, indicating type and grade of tile according to ANSI A137.1 and that tile complies with this standard. Delete if not required or not available, as may be the case with imported tile.

G. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

H. Product Certificates: For each type of product, signed by product manufacturer.

I. Coordinate paragraph below with qualification requirements in Division 1 Section "Quality Requirements." Retain option if needed to establish compliance of products with characteristics specified.

J. Material Test Reports: For each tile-setting and grouting product.

1.7 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate: Certify that products meet or exceed ANSI A137.1.

1.8 MAINTENANCE MATERIALS

A. Furnish extra materials described below that match products installed, packaged with protective covering for storage, and identified with labels describing contents.

B. Furnish quantity of full-size units equal to 2.0% of amount installed.

1.9 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than five (5) years experience.

B. Manufacturer’s Qualifications: Experienced firm in the manufacture of products and/or systems similar to those required for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce units as required.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

D. Installer's Qualifications: Work done under this Section of the Specifications shall be performed by mechanics skilled and experienced in the class of Work involved having successfully installed not less than 5 projects of similar size and scope to work of this Project. Installer shall be familiar with special requirements as herein indicated and shall comply with requirements of authorities having jurisdiction.

E. Workmanship shall be in accordance with best trade practices, and surface shall be true to line and free from waves and other imperfections. Joints between tiles shall be maintained uniform and even and properly grouted.

F. Work shall comply with applicable requirements of the following:
   1. Tile Council of North America (TCNA) Installation Guidelines.
   2. ANSI A108 Series.

G. Source Limitations for Tile: Obtain tile from one source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

H. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

I. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.11 FIELD CONDITIONS

A. This Contractor shall inspect the job condition before starting, and his starting work constitutes approval of conditions.

B. All flooring variations less than 1/8" in 10 ft., chips, and cracks are the responsibility of the flooring subcontractor to feather/patch prior to the installation of tile.

C. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.12 WARRANTY

A. This Contractor shall fully guarantee all materials and labor under this section for a period of not less than one (1) year from date of final acceptance of the building against all defects in both workmanship and materials, and he shall promptly correct and/or replace such faulty work if so notified.

1.13 PERFORMANCE

A. Tile installation shall comply with the “Handbook for Ceramic Tile Installation” by the Tile Council of North America (TCNA).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be as indicated on drawings. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Refer to drawings for finish selections.

B. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 GENERAL

A. Provide tile conforming to ANSI A137.1, Section 9.6:
   1. Tile shall meet or exceed the ADAAG slip resistance coefficient of 0.42 or greater for flat surfaces and 0.65 or greater for sloped surfaces per DCOF AcuTest value.
   2. Interior Floor Tile shall meet or exceed ANSI A326.3 Dynamic Coefficient of Friction of 0.42 or greater for dry and level surfaces (ID) and wet and level surfaces (IW) and DCOF of 0.65 or greater for inclined surfaces and ramps per DCOF AcuTest value.
   3. Interior Floor Tile in wet areas with minimal or no footwear shall meet or exceed ANSI A326.3 DCOF of 0.60 or greater (showers, steam rooms, pool decks and locker rooms).

B. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 PORCELAIN TILE (PP-1)

A. Porcelain Floor Tile
   1. Basis-of-Design Product: Refer to drawings for finish, shape, and size selections.

2.4 MATERIALS

A. Self-Leveling Underlayment: Quick set type, as recommended by membrane manufacturer, required to provide a flat, level surface for direct receipt of tile and other floor coverings on dry, interior installations.

B. Latex Underlayment: Quick set type, as recommended by membrane manufacturer, as required providing positive drainage to floor drains.

2.5 GROUT AND MORTAR MATERIALS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. MAPEI Corporation.

2. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

B. Grout and Mortar Basis of Design Product: "Kerapoxy CQ" Premium, Epoxy Grout and Mortar with Color-Coated Quartz.
1. ANSI: Meets or exceeds A118.3 requirements.
2. ISO 13007: Classification R2/RG.
3. Composition: Two-component, 100%-solids.
4. Nonsagging/nonslumping in joints up to 3/8" (10 mm) in width.
5. Water-cleanable.
6. High stain resistance.
7. Does not require sealant.
8. Color: As selected by Architect from manufacturer's full range of colors.

2.6 ACCESSORIES

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Elastomeric Joint Caulk: ANSI A108.01.3.7, provide in all joints between floors and walls and at joints between tile and dissimilar materials and as indicated on the drawings.
1. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
2. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Release: Water soluble, pre-grout coating "Aqua Mix Grout Release" as manufactured by Custom Building Products.

F. The Contractor to supply all necessary base, cap edge corner, trim, or accessory tiles required for a complete installation.

G. Metal Trim:
1. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   a. Schluter.
   b. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.
2. Edge Trim:
   a. Basis of Design Product: "Schiene."
   b. Material: Extruded aluminum
   c. Finish: Satin nickel anodized.
   d. Installation method: Mechanically fastened. Gluing is not permitted.

e. Provide at all edges unless indicated otherwise.

3. Corner Trim:
   a. Basis of Design Product: “Jolly.”
   b. Material: Extruded aluminum.
   c. Finish: Satin nickel anodized.
   d. Installation method: Mechanically fastened. Gluing is not permitted.
   e. Provide at all outside corners unless indicated otherwise.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturer’s written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Install tile, per TCNA F113 and F113A, sloping to floor drains, where applicable, in accordance with ANSI specification A-108.5.
   1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 100 percent mortar coverage:
      a. Tile floors composed of rib-backed tiles.
      b. Tile floors composed of tiles 6 by 6 inches or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: See drawings for jointing pattern. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions.
   1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Inside Corners: Do not grout inside corners, seal joint with sealant to match grout color.

F. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, VCT, or other flooring that finishes flush with top of tile.

3.4 LAYOUT

A. Lay out tilework so as to minimize cuts less than one-half tile in size.

B. Locate cuts in both walls and floors so as to be least conspicuous.

C. Lay out tile wainscots per drawings.

D. Align wall joints to give straight, uniform grout lines, plumb and level.

E. Align floor joints to give straight uniform grout lines parallel with walls.

F. Make joints between tile sheets same width as joints within sheets so extent of each sheet is not apparent in finished work.

G. Porcelain tile can have large variances in sizing. Do not mix sizes and types of tiles in pattern areas. Joints that do not line up or joint widths that vary will be unacceptable.

3.5 WORKMANSHIP

A. Supply first-class workmanship in tilework.

B. Use products in strict accordance with recommendations and directions of manufacturer.

C. Proportion mixes in accordance with latest ANSI standard specifications.

D. Smooth exposed cut edges.

E. Be sure cut edges are clean before installing tiles.

F. Fit tile carefully against trim and accessories, also around pipes, electrical boxes, and other built-in fixtures so that escutcheons, plates, and collars will completely overlap cut edges.

G. When using glazed tile sheets, minimize tearing sheets apart by drilling pipe holes as much as possible.

H. Be sure tile work is free of grout film upon completion.

3.6 GROUTING

A. Grouting shall be installed in accordance with ANSI A108.10 and the manufacturer's recommended procedures and precautions during application and cleaning, unless noted otherwise.

B. Where noted, for chemical-resistant epoxy grouts, comply with ANSI A108.6.

C. Rinse tilework thoroughly with clean water before and after using chemical cleaners.

D. Use cleaning products and methods recommended by the grout manufacturer for the specific application.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

F. All cleaning solutions and procedures shall be in compliance with project IAQ Management Plan.

3.8 PROTECTION

A. The Contractor installing tile shall make such provisions as necessary to protect the tile against damage of any kind after installation. Damaged tile that appears in the finish work prior to turning the building over to the Owner is to be repaired or replaced by this Contractor without further cost to the Owner. Protect adjoining areas and surfaces and clean up everything at completion. Remove scrap, debris, and surplus material as it accumulates.

END OF SECTION

SECTION 09 51 23 - ACOUSTICAL CEILING PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Acoustical panels for ceilings.
   2. Suspension systems.

1.3 REFERENCE STANDARDS

A. ASTM C423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

C. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

D. ASTM A641 – Specification for Zinc-Coated (galvanized) Carbon Steel Wire.

E. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

F. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

H. ASTM E 119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

I. ASTM E795 – Standard Practice for Mounting Test Specimens During Sound Absorption Tests.

J. ASTM E1264 – Standard Classification for Acoustical Ceiling Products.

K. ASTM E1414 – Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

L. ASTM E1477 – Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer.

M. Ceilings and Interior Systems Contractors Association (CISCA) – Acoustical Ceilings: Use and Practice.

N. UL – Fire Resistance Directory.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Samples:
   1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
   2. Suspension-System Members: 6-inch long Sample of each type.
   3. Moldings and Trim: Set of 6-inch long Samples of each type and color.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each acoustical tile ceiling, for tests performed by a qualified testing agency.
   1. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Manufacturer's Qualifications: Employ only manufacturers making the specified products as a regular and current production item.

D. Single-Source Responsibility for Ceiling and suspension Units: Obtain each type of acoustical ceiling unit and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.8 PRE-INSTALLATION MEETING

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.
   2. This stock shall be designated for use by Owner only, after completion of the Project and shall not be used for repair or replacement during the one-year warranty period.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, and partition system.

1.12 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's warranty that the ceiling panels and suspension systems shall be free from sagging or warping for indicated warranty.
   1. Warranty Period: Not less than ten (10) years from the Date of Substantial Completion.

1.13 PERFORMANCE

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Refer to drawings for finish selections.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product.
   1. Armstrong
   2. CertainTeed Corporation.
   3. USG Interiors, Inc.
   4. Gold Bond – National Gypsum
   5. Rockfon

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
   1. Basis of Design Product: Refer to drawings for finish selections.

B. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

D. Mounting Method for Measuring NRC: Type E 400 (plenum mounting in which face of test specimen is 15-3/4" away from the test surface) per ASTM E 795-05(12).

2.3 ACOUSTICAL TILES

A. ACP-1
   1. Basis of Design: Tegular.
      a. Edge: Angled Tegular
      b. Size: 24" x 24" x 3/4"
      c. NRC: 0.70
      d. Color: White
      e. Seismic design category: D

2.4 METAL SUSPENSION SYSTEMS

A. Basis of Design: “Prelude XL 15/16" Steel Exposed Tee”.

B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
   1. Electrogalvanized in all spaces unless indicated otherwise.
   2. Hot-dipped galvanized shall be used in the food service-related areas.

C. High-Humidity Finish: Provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M in food service, damp and potentially wet spaces.
   1. Provide aluminum cap in food preparations areas and associated spaces.
   2. Provide aluminum cap in spaces that may experience damp or wet conditions.

D. Structural Classification: Intermediate Duty System.

E. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.

F. Color: White.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings, and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.

B. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.

D. Ceiling Edge Trim: Provide “Straight Axiom Classic Trim” as manufactured by Armstrong World Industries.
   1. Provide wherever a lay-in ceiling is located lower than an adjacent gypsum board ceiling.
   2. Provide outside and inside corner trim, splice plates, clips and miscellaneous items for a complete installation.
   3. Size: 6” or as indicated on the drawings.
   4. Size: As required for ceiling height change as indicated on the drawings.
   5. Color: As selected by the Architect.

2.6 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Post-installed expansion anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
   2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106 inch diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. Exposed and concealed joints nonsag, paintable, non-staining latex sealant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and no more than 20 degrees to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Do not place hanger wires thru cable trays or attach to cable trays and conduits or other similar items.
11. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
13. Secure wire hangers to the four corners of all light fixtures.
14. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
15. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.
16. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
17. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
18. Do not use exposed fasteners, including pop rivets, on moldings and trim.
19. All seams to be tight and flush.
20. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.

B. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.

C. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

This page intentionally left blank

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included References are included

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Resilient tile flooring (LVT-1).
   2. Resilient base (RES-1, RES-2).
   3. Installation accessories.

1.3 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2023).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

E. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.

F. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

J. NSF 332 - Sustainability Assessment for Resilient Floor Coverings; 2022.

K. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plans and floor patterns.

C. Verification Samples: Submit two samples, 12 by 24 inch (304.8 by 609.6 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.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Flooring Material: 100 square feet (9.29 square meters) of each type and color.
   2. Extra Wall Base: 100 linear feet (30.48 linear meters) of each type and color.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.7 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.

1.8 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Floor tile: Karndean Designflooring.
   2. Wall base: Roppe Corp.
      a. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product.
         1) Mannington.
         2) Nora Rubber Products.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 TILE FLOORING

A. Vinyl Tile (LVT-1)

1. Composition: Solid vinyl with color and pattern throughout thickness.
2. Thickness: 3mm, 30mil.
3. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
5. Size: See drawings for size information.
6. Pattern: To be selected by Architect from manufacturer's full range.
7. Color: To be selected by Architect from manufacturer's full range.

2.3 RESILIENT BASE

A. Resilient Base (RES-1)
   1. Location: Millwork base.
   2. Meets or exceeds ASTM F1861 requirements.
   3. Type TS, rubber, vulcanized thermoset.
   4. Style: B, Cove.
   5. Height: 4 inches (100 mm).
   6. Length: Roll.
   7. Color: To be selected by Architect from manufacturer's full range.
   8. Accessories: Premolded external corners and internal corners.

B. Resilient Base (RES-2):
   1. Location: All areas, unless otherwise noted.
   2. Meets or exceeds ASTM F1861 requirements.
   3. Type TS, rubber, vulcanized thermoset.
   4. Style: B, Cove.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings and Edge Strips:
   1. Flooring: Same material as flooring.
   2. Base: Same material as base.

D. Transition Type:
   1. See Specification Section 09 30 00- Tiling for transition type information.

PART 3 EXECUTION

3.1 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. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.

E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
   2. Resilient Strips: Attach to substrate using adhesive.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

H. Install flooring in recessed floor access covers, maintaining floor pattern.

3.4 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install loose-laid tile, fit interlocking edges tightly.

E. Install loose-laid tile using interlocking pins to secure tiles to each other.

F. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.5 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

This page intentionally left blank

SECTION 09 68 13 - TILE CARPETING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Carpet Tile (CPT-1, CPT-2).
   2. Entry Mat (EM-1).
   3. Carpet Accessories.

1.3 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

F. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

H. AATCC – American Association of Textile Colorist and Chemists.

I. FCIB – Flooring Covering Installation Board.

J. CRI – Carpet and Rug Institute.

K. Floor Covering Installation Contractor’s Association.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
   2. Existing flooring materials to be removed and remain.
   3. Carpet type, color, and dye lot.
   4. Type of subfloor.
   5. Type of installation and pattern of installation.
   6. Pattern type, location, and direction.
   7. Type, color, and location of insets, borders edge, transition, and other accessory strips.

8. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: Four (4) full-size samples for each type specified.
   2. Exposed Edge Stripping and Accessory: 12-inch long Samples.

D. Maintenance Data: For carpet to include in maintenance manuals specified in and include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

B. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Carpet manufacturer shall have no less than five (5) years experience of producing recyclable carpet and shall have published product literature clearly indicating compliance with requirements of this section.

B. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements and has successfully installed similar products to those required as work of this Project for not less than five (5) years.
   1. Additional Installer Qualifications: Carpet manufacturer shall provide written approval to Owner that installer is an approved installer for all carpet materials specified on this project.
   2. Employ only experienced Contractors (Installers) skilled in the successful installation of specified materials and assemblies on similar projects for not less than five (5) years.

C. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

D. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.9 MOCK-UPS

A. Before installing carpet, install mock-ups for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:

B. Install mock-ups in the location and of the size indicated or, if not indicated, as directed by Architect.

C. Notify Architect seven (7) days in advance of dates and times when mock-ups will be installed.

D. Demonstrate the proposed range of aesthetic effects and workmanship.

E. Obtain Architect's approval of mock-ups before starting work.

F. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

G. Remove mock-ups when directed.

H. Approved mock-ups may become part of the completed Work if undamaged at time of Substantial Completion.

1.10 PRE-INSTALLATION MEETING

A. The Contractor shall conduct a pre-installation meeting at the project site a minimum of 30 days prior to any work being installed as indicated in this section and other related sections that require coordination with this section.

B. Pre-installation conference shall be conducted at the project site.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.12 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not deliver or install carpet until building is enclosed, wet work in spaces is complete and dry, HVAC system is operating, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.13 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet: Full-size units equal to 10 percent of amount installed for each type indicated.
   2. Attic stock shall be designated for use only after completion of Project and shall not be used for repair or replacement during warranty period.
   3. Turn over all extra carpet not needed to complete the installation.

1.14 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Written warranty, non-prorated, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than ten percent (10%) loss of face fiber/yarn loss by weight normal use, edge raveling, runs, loss of tuft bind strength, dimensional stability, excess static discharge, delamination, and stain resistance.
   3. Warranty Period: Fifteen (15) years from Date of Substantial Completion.
   4. Static electricity will maintain static below 3.5 kv at 70º and 20% relative humidity.
   5. Handle any adjustments during the warranty period within fifteen (15) days of written notice.

6. The backing structure will not delaminate from the face structure nor will there be any shrinkage affecting the performance of the face and backing structure for fifteen (15) years.

C. Installer's Warranty: Contractor (Installer) shall fully guarantee installation against defects in materials, workmanship, seaming, and loss of adhesion for indicated warranty period.
   1. During warranty period, Installer shall repair or replace all defective areas as directed and at no cost to the Owner.
   2. Warranty Period: Not less than 1 year from Date of Substantial Completion.

1.15 PERFORMANCE

A. Carpet shall conform to the following performance characteristics:
   1. Smoke Density: ASTM E 662 Less than 450.
   2. Flammability: ASTM E 648 Class 1 (Glued Down).
   3. Static Propensity: AATCC 134 Under 3.5 KV.
   4. Comply with ASTM D2859, Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
      a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Basis of Design: See Drawings for Carpet selections.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 CARPET TILE (CPT-1)

A. Basis of Design Product: See drawings for product selection.

2.3 CARPET TILE (CPT-1)

2.4 CARPET TILE (EM-1)

A. Basis of Design Product:

B. Size: See drawings for size information.

C. Pattern: See Drawings for pattern information.

D. Color: See Drawings for color information.

E. Fiber Content:

F. Dye Method: Solution dyed.

G. Gage:

H. Pile Density:

I. Surface Pile Weight:

J. Backing System:

2.5 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, antimicrobial agent, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by carpet manufacturer.

1. VOC Limits: ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products for carpet and adhesives.
2. Adhesive: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated; that complies with flammability requirements for installed carpet and recommend by carpet manufacturer for releasable installations.

2.6 FLOOR ACCESSORIES

A. Rubber Transitions
   1. Description: Transitions, reducer, edge strips and adaptors strips as required to accommodate edge conditions and joints between different flooring materials.
   2. Manufacturer shall be same manufacturer as resilient wall base.
   3. Profile and Dimensions: Provide profiles to fit conditions and as recommended by flooring installer unless indicated otherwise. Profile and width of height required to protect exposed edge of carpet and provide transition to adjacent materials, and of maximum lengths to minimize running joints. Final Selection shall be as approved by the Architect.
   4. Locations: Provide at transition between floor types, and at edges of floor covering. See drawings for exact locations.

B. Vinyl Transitions
   1. Description: Transitions, reducer, edge strips and adaptors strips as required to accommodate edge conditions and joints between different flooring materials.
   2. Basis of Design: “Slim Line Reducer/Edge Strips”
      a. Manufacturers: The basis of design products are manufactured by Johnsonite. Equal or better performing products of other manufacturers will be considered for acceptance by the Architect.
   3. Profile and Dimensions: Provide profiles to fit conditions and as recommended by flooring installer unless indicated otherwise. Profile and width of height required to protect exposed edge of carpet and provide transition to adjacent materials, and of maximum lengths to minimize running joints. Final Selection shall be as approved by the Architect.
   4. Locations: Provide at transition between floor types and at edges of floor covering that would otherwise be exposed unless indicated otherwise.
   5. Colors and Patterns: As selected by Architect from full range of industry colors.

C. Metal Transitions at Flooring
   1. See Specification Section 09 30 00 - Tiling, for metal transition information.
   2. Profile size and height appropriate for floor material thickness.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Moisture Vapor Emission Test: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas and as indicated below:
   1. Anhydrous Calcium Chloride Test: Conduct test in accordance with the current version of ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours, however not to exceed manufacturer’s requirements.
   2. Relative Humidity Test: Testing for internal relative humidity of concrete slabs. Conduct test in accordance with current version of ASTM F 2170 using in in-situ probes. Proceed with

installation only after substrates have a maximum 75 percent relative humidity level measurement, not to exceed manufacturer's requirements.

3. Testing for Alkalinity: Testing the PH at the surface must be conducted in accordance with the current version of ASTM F710, not to exceed manufacturer's standards.
4. Perform additional moisture tests recommended in writing by adhesive and flooring manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."

B. Installation Method: As recommended in writing by carpet manufacturer, with non-directional units and merge-able dyelots.

C. Apply carpet adhesives by roller or spray method over entire surface to receive carpet, in accordance with carpet manufacturer's instructions. Allow adhesive to set and/or dry before initiation of carpet installation, per carpet manufacturer's instructions.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
   1. Where carpeting does not continue beyond a door to another room, extend carpet into door reveals so that carpet stops under door when door is in closed position.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders to comply with CRI, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations and as indicated by the Architect.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, and "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or

recommended in writing by carpet manufacturer and as required by CRI, Protecting Indoor Installations.

3.5 INDOOR AIR QUALITY

A. Temporary ventilation: Provide temporary ventilation as specified – Indoor Air Quality (IAQ) Management, and as follows:

B. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees Fahrenheit (15.56 degrees Celsius) minimum to 90 degrees Fahrenheit (32.22 degrees Celsius) maximum continuously for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Architect.

END OF SECTION

This page intentionally left blank

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Exterior paint and coating systems.

1.3 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

B. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.

C. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2025.

D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. EPA – Method 24.

G. GS-11, GC-03.

H. NACE International (National Association of Corrosion Engineers) – Industrial Maintenance Painting.

I. NPCA (National Paint and Coatings Association) – Guide to U.S. Government Paint Specifications.

J. PDCA (Painting and Decorating Contractors of America) – Architectural Painting Specifications Manual.

K. PDCA Standard P1-04 Touchup Painting and Damage Repair; Financial Responsibility.

L. PDCA Standard P5-04 Benchmark Sample Procedures for Paint and other Decorative Coating System.

M. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.

N. SSPC-SP 1 – Solvent Cleaning.

O. Modern Guide to Paint Specifications (current edition) – Standard Type 1.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specifications
   4. Storage and handling requirements
   5. Application methods

6. Cautions and VOC levels, certification from manufacturer that products comply with local regulations controlling volatile organic compounds (VOC's).
7. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
8. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

B. Samples:
1. Submit a complete set of color chips representing the full range of manufacturer's color samples available.
2. Submit two 9" x 9" samples illustrating selected colors and textures for each type.

1.7 INFORMATION SUBMITTALS

A. Closeout Documents:
1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule designating where each product/color/finish was used. It shall also include care and cleaning instructions, touch up procedures, and a Product Data Sheet for each product used.

1.8 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.
a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. and at exterior inside and outside corner.
1) 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.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5-years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum 5-years documented experience.

1.10 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

B. Painting manufacturer and Contractor shall conform to Federal Rules and Regulations, Vol. 63, No. 176, September 11, 1998, State and local VOC (Volatile Organic Compound) Regulations in area where Project is located. Notify Architect in writing if variations to Specifications herein are required.
1. VOC content shall be a maximum 350 gm/liter, unless noted otherwise

C. VOC Content: Determine VOC (Volatile Organic Compound) content of solvent borne and waterborne paints and related coatings in accordance with EPA Method 24 or ASTM D3960.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees Fahrenheit (7.22 degrees Celsius).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Storage:
   1. Store paint materials in a properly ventilated area at the temperature range r required by the manufacturer'.
   2. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with manufacturer’s and other regulating authorities having jurisdiction.

1.12 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees Fahrenheit (35 degrees Celsius).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees Fahrenheit (-15 degrees Celsius) above the dew point; or to damp or wet surfaces.

1.13 MAINTENANCE MATERIAL

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.

B. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.14 WARRANTY

A. Warranty: Manufacturer shall warrant the product against defects in materials or workmanship and agrees to repair or replace components that fail within specified warranty period. The warranty period shall commence at the time of substantial completion and extend for a period of Five (5) years.

B. Special Warranty: General Contractor shall provide a letter of warranty stipulating that any paint system failure including but not limited to peeling, cracking, premature or uneven fading and effervescing will be repaired within 30 days of notification by the owner at no additional cost to the Owner and shall extend for a period of 3 years from substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. See Finish Material Legend on drawings for finish selections.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Sherwin Williams.
   2. Pittsburgh Paints Co., www.ppgpaints.com/#sle.
   3. Pratt & Lambert.
   4. Benjamin Moore & Co.

C. Single Source: Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

2.2 COMPATIBILITY

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists.

B. Paint materials and equipment shall be compatible in use; finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; tools and equipment shall be compatible with the coating to be applied.
   1. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristic of finish materials to ensure use of compatible primers.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

D. The term "paint," as used herein, includes enamels, paints, sealers, stains, fillers, emulsions, and other coatings, whether used as prime, intermediate, or finish coats.

2.3 ACCEPTANCE OF SPECIFICATION

A. By submitting a proposal, the Contractor has reviewed the bidding documents with the painting subcontractor and accepts the Specifications as sufficient to produce approved painting results. If the painting subcontractor contends that the materials or number of coats specified will not produce satisfactory results, he shall so notify the Architect directly or indirectly through a Bidding Contractor 14 days prior to receipt of bids for proper action.

B. The type of material to be used and the number of coats to be applied are listed in the "Painting Schedule" of this section of these specifications. Also refer to Room Finish Schedule.
   1. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
   2. The Architect shall not be limited in the number of colors selected for single space or for the complete Project.

2.4 PAINTING SCHEDULE

A. Concrete Substrates
   1. Textured Coating
      a. 1st Coat: Tex·Cote XL-70 “W” Primer.
      b. 2nd Coat: Tex·Cote XL-70 “W” Textured Coating (15 mil (0.381 mm) dry).
      c. Texture: As selected by the Architect.
   2. Clear Water Repellant:
      a. 1st Coat: Siloxane Water Repellant, MPI #117.
      b. 2nd Coat: Siloxane Water Repellant, MPI #117.

B. Cementitious Siding
   1. Latex Systems
      a. Semi-Gloss Finish
         1) S-W Loxon Concrete & Masonry Primer Sealer, LX02W50 (3.2-dry) – MPI#3.
         2) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66W1150 – MPI#153.
         3) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66W1150 (2.5-4.0-mil dry per coat).
      b. Satin Finish
         1) S-W Loxon Concrete & Masonry Primer Sealer, LX02W50 (3.2-dry) – MPI#3.
         2) S-W SuperPaint Acrylic Satin, A89 Series – MPI#15.

3) S-W SuperPaint Acrylic Satin, A89 Series (1.4-mil dry per coat).

C. CMU Substrates:
1. Latex System:
a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat (Gloss Level 1), MPI #10.
2. Clear Water Repellant:
a. 1st Coat: Siloxane Water Repellant, MPI #117.
b. 2nd Coat: Siloxane Water Repellant, MPI #117.

D. Steel Substrates:
1. Latex over Alkyd Primer System:
a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss, (Gloss Level 5), MPI #11.

E. Galvanized-Metal Substrates:
1. Latex System:
a. Prime Coat: Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss, (Gloss Level 5), MPI #11.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:
1. Latex System:
a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss, (Gloss Level 5), MPI #11.

G. Wood Substrates: Including wood trim, architectural woodwork, wood-based panel products, glued-laminated construction.
1. Latex System:
a. Prime Coat: Primer, latex, for exterior wood, MPI #6.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss, (Gloss Level 5), MPI #11.

H. Gypsum Board and Plaster Substrates:
1. Latex System:
a. Prime Coat: Primer, Alkali Resistant, Water Based, exterior, MPI #3.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, (Gloss Level 5), MPI #10.

I. Architectural PVC, Plastic, Fiberglass:
1. Latex System:
a. Prime Coat: Latex Primer/Sealer, MPI #17.
b. Intermediate Coat: Latex. exterior, matching topcoat.
c. Topcoat: Industrial Acrylic Semi-Gloss Coating, MPI #153.

2.5 MATERIALS - GENERAL REQUIREMENTS

A. Paints and Coatings – General
1. Unless otherwise indicated, provide factory-mixed coatings.
2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
3. Do not reduce, thin, or dilute coatings or add materials to coatings unless approved in manufacturer's product instructions.
4. Confirm VOC’s need by using the products MSDS sheets.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as “best” by the manufacturer.

2.6 ACCESSORIES

A. Coating application accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows (Do not apply finishes unless moisture content of surfaces is below the following maximums):
   1. Concrete: 12 percent.
   2. Fiber-Cement Board: 12 percent.
   3. Masonry (Clay and CMUs): 12 percent.
   4. Wood: 15 percent.
   5. Gypsum Board: 12 percent.
   6. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

E. Do not begin application of coatings until substrates have been properly prepared; notify Owner’s Representative of unsatisfactory conditions before proceeding.

F. If substrate preparation is the responsibility of another installer, notify Owner’s Representative of unsatisfactory preparation before proceeding.

G. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

H. Test shop applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

C. The surface shall be dry and in sound condition. Remove all oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.

D. Provide barrier coats over incompatible primers or remove and re-prime. Notify Architect in writing about anticipated problems using the specified finish coat material with substrates primed by others.

E. Impervious Surfaces:
   1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
   2. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces:
   1. Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP1 Solvent Cleaning.

G. Cementitious Siding:
   1. Lightly scrape areas with a wire brush, sand scraped edges, and remove any old caulking or damaged siding.
   2. Allow each coat to dry completely before applying the next.

H. Block/Unit Masonry (Cinder and Concrete)
   1. Remove all loose mortar and foreign material.
   2. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners.
   3. Let concrete and mortar cure at least 30 days at 75°F unless the manufactures products are designed for application prior to the 30-day period.
   4. The pH of the surface and moisture content must be in accordance with the paint manufacturer's recommendations prior to painting.

I. Concrete:
   1. Remove contamination by washing with an appropriate cleaner, rinse thoroughly.
   2. The pH of the surface and moisture content shall be in accordance with the paint manufacturer's recommendations prior to painting.
   3. Allow the surface to thoroughly dry.
   4. Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid or other etching cleaner. Flush floor with clean water to neutralize acid and allow to dry before painting.
   5. Fill bug holes, air pockets, and other voids under another section with a cement-patching compound of sufficient cohesive strength to support the specified coating system.

J. Drywall:
   1. Shall be clean, dry and all dust removed prior to painting.
   2. All nail heads must be set and spackled.
   3. Tape all joints and cover with a joint compound.
   4. Spackled nail heads and tape joints shall be sanded smooth.

K. Galvanized Surfaces:
   1. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils.
   2. Apply a test area, priming as required.
   3. Allow the coating to cure in accordance with the manufacturer's recommendation before testing.
   4. Perform adhesion tests in accordance with ASTM 3359 Adhesion by Tape Test.
   5. If adhesion is poor, then notify Owner's representative that additional surface preparation under another section is necessary to remove pre-treatments or contaminants that interfere with adhesion of the coating.

L. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

M. Steel: Structural, Plate, etc.:
   1. Check other sections for additional surface preparation and shop priming of bare steel surfaces.
   2. Surface preparation shall include appropriate SSPC recommended methods.
   3. Shop primer shall be compatible with the field-applied coatings.
   4. Surfaces shall be dry and clean prior to the application of field-applied coatings.
   5. Remove all contaminants in accordance with SSPC-SP1 Solvent Cleaning or SSPC Method recommended for condition of substrate.

N. Wood:
   1. Shall be clean and dry, then prime and paint as soon as possible.
   2. Scrape, sand, and spot prime knots and pitch streaks before a full priming coat is applied.

3. Patch all nail holes and imperfections with a wood filler or putty and sand smooth after application of primer.
4. Wood and Metal Doors Scheduled for Painting: Finish doors on tops, bottoms, and side edges same as hinge side face, unless otherwise indicated.
5. Seal with shellac any marks, which may bleed through surface finishes.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

D. Use only thinners approved by the paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat of lighter shade to facilitate identification of each coat where multiple coats of the same materials are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

F. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming surface treatment specified under other sections

G. Preparation and testing of existing painted surfaces, indicated to be repainted to accommodate new work, shall be performed as work of this section.

3.4 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

B. Use applicators and techniques suited for paint and substrate indicated.

C. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

D. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates

E. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

F. 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.

G. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

H. 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.

3.5 FIELD QUALITY CONTROL

A. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified, and sealed, and certified in presence of Contractor.

B. Testing laboratory will perform appropriate tests for one or each of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance, and quantitative materials analysis.

C. A test patch for adhesion may also be required. The procedure for the test patch is as follows:
   1. An area that represents the worst condition of the existing paint is selected.
   2. The surface is prepared as appropriate for the repaint work.
   3. The new coating or coating system is applied.
   4. The coating is allowed to cure for at least 7 days at 75 degrees Fahrenheit (23.89 degrees Celsius). or according to the coating manufacturer's instructions.
   5. After proper curing the adhesion is tested using an acceptable method such as the Adhesion by Tape Test (ASTM D 3359).

D. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove noncomplying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the 2 coatings are noncompatible.

3.6 EQUIPMENT

A. Paint the following work where exposed.
   1. Uninsulated metal and plastic piping.
   2. Pipe hangers and supports.
   3. Metal and plastic conduit.

3.7 CLEAN-UP AND PROTECTION

A. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Provide "Wet Paint" signs as required to protect newly painted finishes.

C. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

D. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

E. 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.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.8 TOUCH- UP AND DAMAGE REPAIR

A. Contractor shall repair all deficiencies in coating application in accordance with PDCA Standard P1-04.

B. Inform Owner’s representative of all damage to properly painted surfaces and receive authorization prior to performing damage repair.

END OF SECTION

This page intentionally left blank

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Interior paint and coating systems.

1.3 REFERENCE STANDARDS

A. ASTM D16 – Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D3359 – Standard Test Methods for Measuring Adhesion by Tape Test.

C. ASTM D4442-92 – Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood Base Materials.

D. EPA – Method 24.

E. GS-11, GC-03.

F. NACE International (National Association of Corrosion Engineers) – Industrial Maintenance Painting.

G. NPCA (National Paint and Coatings Association) – Guide to U.S. Government Paint Specifications.

H. PDCA (Painting and Decorating Contractors of America) – Architectural Painting Specifications Manual.

I. PDCA Standard P1-04 Touchup Painting and Damage Repair; Financial Responsibility.

J. PDCA Standard P5-04 Benchmark Sample Procedures for Paint and other Decorative Coating System.

K. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.

L. SSPC-SP 1 – Solvent Cleaning.

M. Modern Guide to Paint Specifications (current edition) – Standard Type 1.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.6 SUBMITTALS

A. Product Data: For each type of product:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specifications
   4. Storage and handling requirements
   5. Application methods
   6. Cautions and VOC levels, certification from manufacturer that products comply with local regulations controlling volatile organic compounds (VOC's).
   7. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

8. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

B. Samples:
   1. Submit a complete set of color chips representing the full range of manufacturer's color samples available.
   2. Submit two 9" x 9" samples illustrating selected colors and textures for each type.

1.7 INFORMATION SUBMITTALS

A. Closeout Documents:
   1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as "Custodian Project Color and Product Information" by Sherwin-Williams or equal. Manual shall include an Area Summary with finish schedule designating where each product/color/finish was used. It shall also include care and cleaning instructions, touch up procedures, and a Product Data Sheet for each product used.

1.8 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5-years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum 5-years documented experience.

C. The painting manufacturer's representative shall visit the site and review the paint application during the priming and the finish painting application and report to the Construction Manager, Contractor, and Architect as to the acceptability of the application.

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

B. Painting manufacturer and Contractor shall conform to Federal Rules and Regulations, Vol. 63, No. 176, September 11, 1998, State and local VOC (Volatile Organic Compound) Regulations in area where Project is located. Notify Architect in writing if variations to specifications herein are required.
   1. VOC content shall be a maximum 350 gm/liter, unless noted otherwise.

C. VOC Content: Determine VOC (Volatile Organic Compound) content of solvent borne and waterborne paints and related coatings in accordance with EPA Method 24 or ASTM D3960.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Storage:
   1. Store paint materials in a properly ventilated area at the temperature range required by the manufacturer.
   2. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with manufacturer's and other regulating authorities having jurisdiction.

1.11 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.

1.12 MAINTENANCE MATERIAL

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: 5 percent, but not less than 1 gal. of each material and color applied.

1.13 WARRANTY

A. Contractor shall provide five (5) year warranty against defects in labor and installation of paint materials in the form indicated at the end of this section.

B. Manufacturer shall provide five (5) year warranty against defects in all paint products and materials incorporated into the work.

C. The manufacturer shall assume all responsibility for substrate acceptance and adhesion and to uphold the required warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Sherwin Williams.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Benjamin Moore & Co.
   2. Pittsburgh Paints Co.: www.ppgpaints.com/#sle.

2.2 COMPATIBILITY

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists.

B. Paint materials and equipment shall be compatible in use; finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; tools and equipment shall be compatible with the coating to be applied.
   1. Review other sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristic of finish materials to ensure use of compatible primers.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Adhesion Test: Provide adhesion X-cut and tape test for primer adhesion per ASTM D3359 for every 200 s.f. of primed area.

D. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

E. The term "paint," as used herein, includes enamels, paints, sealers, stains, fillers, emulsions, and other coatings, whether used as prime, intermediate, or finish coats.

2.3 ACCEPTANCE OF SPECIFICATION

A. By submitting a proposal, the Contractor has reviewed the bidding documents with the painting subcontractor and accepts the Specifications as sufficient to produce approved painting results. If the painting subcontractor contends that the materials or number of coats specified will not produce satisfactory results, he shall so notify the Architect directly or indirectly through a Bidding Contractor 14 days prior to receipt of bids for proper action.

B. The type of material to be used and the number of coats to be applied are listed in the "Painting Schedule" of this section of these specifications. Also refer to Room Finish Schedule.
   1. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
   2. The Architect shall not be limited in the number of colors selected for single space or for the complete Project.
   3. The Architect shall make the final selection of the finish sheen.

2.4 PAINTING SCHEDULE

A. Metal – (Doors, Door Frames:Galvanized Steel, Galvanized Aluminum)
   1. Latex Systems
      a. Semi-Gloss Finish
         1) S-W Pro Industrial Pro-Cryl® Universal Primer, B66W1300 Series (2.0 – 4.0-mil dry per coat) – MPI #107
         2) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series – MPI #153
         3) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series (2.5 - 4.0-mil dry per coat)

B. Wood (Wood Doors)
   1. Latex Systems
      a. Semi-Gloss Finish
         1) S-W Premium Wall & Wood Primer, B28W8111 (4-mil wet, 1.8-mil dry) – MPI# N/A
         2) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series – MPI #153
            (a) (2.5 – 4.0-mil dry per coat).

C. Stain Systems (Wood Doors)
   1. Satin Finish
      a. S-W 61807000 Minwax Water Based Wood Stain.
      b. S-W Minwax Water Based Oil Modified Polyurethane Varnish, Satin Clear.

D. Drywall (Walls, Ceiling, etc.)
   1. Latex Systems
      a. Eg-Shel/Satin Finish
         1) S-W Premium Wall & Wood Primer, B28W8111 (4-mil wet, 1.8-mil dry) – MPI #N/A
         2) S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series – MPI #144 X-Green
         3) S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (1.6-mil dry per coat)
      b. Flat Finish Ceiling Only
         1) S-W Premium Wall & Wood Primer, B28W8111 (1.8-mil dry) – MPI #N/A
         2) S-W Harmony Low Odor Interior Latex Flat, B5 Series – MPI #53X-Green
         3) S-W Harmony Low Odor Interior Latex Flat, B5 Series (1.6-mil dry per coat)

2.5 MATERIALS – GENERAL REQUIREMENTS

A. Paints and Coatings – General
   1. Unless otherwise indicated, provide factory-mixed coatings.
   2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless approved in manufacturer's product instructions.
   4. Confirm VOC’s need by using the products MSDS sheets.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as “best” by the manufacturer.

2.6 ACCESSORIES

A. Coating application accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows (Do not apply finishes unless moisture content of surfaces is below the following maximums):
   1. Concrete: 12 percent.
   2. Fiber-Cement Board: 12 percent.
   3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

E. Do not begin application of coatings until substrates have been properly prepared; notify Owner’s Representative of unsatisfactory conditions before proceeding.

F. If substrate preparation is the responsibility of another installer, notify Owner’s Representative of unsatisfactory preparation before proceeding.

G. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

H. Test shop applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove 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. 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. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. The surface shall be dry and in sound condition. Remove all oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.

E. Provide barrier coats over incompatible primers or remove and re-prime. Notify Architect in writing about anticipated problems using the specified finish coat material with substrates primed by others.

F. Impervious Surfaces:
   1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
   2. Rinse with clean water and allow surface to dry.

G. Drywall:

1. Shall be clean, dry and all dust removed prior to painting.
2. All nail heads must be set and spackled.
3. Tape all joints and cover with a joint compound.
4. Spackled nail heads and tape joints shall be sanded smooth.

H. Steel:
1. Check other sections for additional surface preparation and shop priming of bare steel surfaces.
2. Surface preparation shall include appropriate SSPC recommended methods.
3. Shop primer shall be compatible with the field-applied coatings.
4. Surfaces shall be dry and clean prior to the application of field-applied coatings.
5. Remove all contaminants in accordance with SSPC-SP1 Solvent Cleaning or SSPC Method recommended for condition of substrate.

I. Wood:
1. Shall be clean and dry, then prime and paint as soon as possible.
2. Scrape, sand, and spot prime knots and pitch streaks before a full priming coat is applied.
3. Patch all nail holes and imperfections with a wood filler or putty and sand smooth after application of primer.
4. Wood doors scheduled for Painting: Finish doors on tops, bottoms, and side edges same as hinge side face, unless otherwise indicated.
5. Seal with shellac any marks, which may bleed through surface finishes.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

D. Use only thinners approved by the paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat of lighter shade to facilitate identification of each coat where multiple coats of the same materials are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

F. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming surface treatment specified under other sections.

G. Preparation and testing of existing painted surfaces, indicated to be repainted to accommodate new work, shall be performed as work of this section.

3.4 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

B. Use applicators and techniques suited for paint and substrate indicated.

C. 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.

D. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

E. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

F. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

G. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

H. 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.

I. Apply paint in a cross-hatch application to achieve an even coverage.

3.5 FIELD QUALITY CONTROL

A. The right is reserved by Owner/Architect to invoke the following material testing procedure in addition to other tests indicated when and as often as he deems necessary during the period of field painting.

B. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified, and sealed, and certified in presence of Contractor.

C. Testing laboratory will perform appropriate tests for one or each of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance, and quantitative materials analysis.

D. A test patch for applied paint adhesion may be required.
   1. Adhesion text shall provide the adhesion X-cut and tape test for adhesion per ASTM D3359 for areas selected by the Architect.
   2. Areas found to be defective shall have paint removed and repainting shall be provided.
   3. Owner/Architect may require retesting.

E. A test patch for remedial painting adhesion may also be required. The procedure for the test patch is as follows:
   1. An area that represents the worst condition of the existing paint is selected.
   2. The surface is prepared as appropriate for the repaint work.
   3. The new coating or coating system is applied.
   4. The coating is allowed to cure for at least 7 days at 75 degrees F. or according to the coating manufacturer's instructions.
   5. After proper curing the adhesion is tested using an acceptable method such as the Adhesion by Tape Test (ASTM D 3359).

F. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove noncomplying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the 2 coatings are noncompatible.

3.6 EQUIPMENT

A. Refer to Divisions 21, 22, 23, 26, 27, & 28 for schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.

B. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated.
   1. Color band and identify with flow arrows, names, and numbering.

C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:

a. Equipment, including both sides of panelboards.
b. Uninsulated metal and plastic piping.
c. Pipe hangers and supports.
d. Metal and plastic conduit.
e. Tanks that do not have factory-applied final finishes.

2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including both side of panelboards.
   b. Uninsulated metal and plastic piping.
   c. Pipe hangers and supports.
   d. Metal and plastic conduit.
   e. Duct, insulation having cotton or canvas insulation covering or other paintable jacket material.
   f. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
   g. Interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint.
   h. Paint dampers exposed behind louvers and grilles to match face panels.
   i. Other items as directed by Architect.

3.7 CLEAN-UP AND PROTECTION

A. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

C. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

D. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

E. 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.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.8 TOUCH-UP AND DAMAGE REPAIR

A. Contractor shall repair all deficiencies in coating application in accordance with PDCA Standard P1-04.

B. Inform Owner’s representative of all damage to properly painted surfaces and receive authorization prior to performing damage repair.

END OF SECTION

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Dimensional letter signage.

1.3 PRICE AND PAYMENT PROCEDURES

A. Allowances:
   1. See Section 01 21 00 - Allowances for cash allowances affecting this section.

1.4 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

1.5 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.6 ACTION SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

B. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

C. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.
   1. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.
   2. Verification Samples: Submit samples showing colors and finishes specified.

1.7 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

B. Manufacturer's qualification statement.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at a normal room temperature of 68 to 72 degrees F (20 to 22 degrees C).

1.10 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. A.R.K. Ramos: www.arkramos.com/#sle.
   2. CityScapes Inc: www.cityscapesinc.com/#sle.
   3. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
   4. Inpro Corporation: www.inprocorp.com/#sle.
   5. Takeform: www.takeform.net/#sle.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: As selected by Architect from manufacturer's full range..
   2. Thickness: Manufacturer's standard for letter size.
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font: Times New Roman.
      b. Character Case: Upper case only.
   5. Finish: As selected by Architect from manufacturer's full range.
   6. Color: As selected by Architect from manufacturer's full range..
   7. Mounting: Projected mount with collars.

2.3 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until acceptance by Owner. Repair or replace damaged items.

END OF SECTION

SECTION 10 14 23 - PANEL SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Panel signage.

1.2 PRICE AND PAYMENT PROCEDURES

A. Allowances:
   1. See Section 01 21 00 - Allowances for cash allowances affecting this section.

1.3 REFERENCE STANDARDS

A. ASTM A475 - Standard Specification for Metallic-Coated Steel Wire Strand; 2022.

B. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods; 2023.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. 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.

B. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. 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.

C. Samples: Submit one sample indicating sign style, font, and method of attachment.
   1. Verification Sample: Submit sample showing color, material, and finish specified.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

B. Manufacturer's qualification statement.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.8 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.

1.9 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. Inpro Corporation: www.inprocorp.com/#sle.
   3. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.

2.2 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room signs.
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: As indicated on drawings.
   4. Total Thickness: As indicated on drawings..
   5. Sign Edges: As indicated on drawings..
   6. Letter Edges: As indicated on drawings..
   7. Corners: As indicated on drawings..
   8. Color and Font, unless otherwise indicated:
      a. Character Font: As indicated on drawings..
      b. Character Case: As indicated on drawings..
      c. Background Color: As indicated on drawings..
      d. Character Color: As indicated on drawings. color.
   9. Material: Laminated colored plastic engraved through face to expose core as background color.
   10. Material: One-piece injection molded acrylic plastic with raised letters and braille.
   11. Material: High gloss acrylic plastic with letters and graphics sandblasted to dull sheen.
   12. Tactile Letters: Raised 1/32 inch minimum.
   13. Braille: Grade II, ADA-compliant.
   14. One-Sided Wall Mounting: Double-sided tape adhesive.

2.3 SIGNAGE APPLICATIONS

A. See Signage Package for all sign types and locations.

2.4 ACCESSORIES

A. Cable Display Systems: Sizes and configurations indicated on drawings.

B. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material

requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.

1. 3M.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 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 acceptance by Owner. Repair or replace damaged items.

END OF SECTION

This page intentionally left blank

SECTION 10 28 00 - TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Toilet accessories.

1.3 REFERENCE STANDARDS

A. ANSI A117.1 – Safety Standards for the Handicapped.

B. ADA Accessibility Guidelines for Buildings and Facilities July 23, 2004 – Provisions for Children.

C. ASTM A123 /A123M – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

E. ASTM A269 – Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

F. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

G. ASTM A794 – Standard Specifications for Commercial Steel, Carbon, Cold-Rolled.

H. ASTM B456 – Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

I. ASTM C1036 – Standard Specification for Flat Glass.

J. ASTM C1048 – Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

K. ASTM C1503 – Standard Specification for Silvered Flat Glass Mirror.

L. ASTM D3960 - Standard Practice for Determiing Volatile Organic Compounds (VOC) Content of Paints and Related coatings; 2005 (Reapproved 2018.)

M. ASTM F446 - Standard Consumer Safety Specifications for Grab Bars and Accessories Installed in the Bathing Area; 2019.

N. NFPA - National Electric Code; Most Recent Edition Adopted by Authority Having Juristriction, Including All Applicaple Ammendments and Supplements.

O. OSHA Department of Labor CFR 29, Section 1910.141: Sanitation.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions gauges, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

B. Samples: Submit two samples of each accessory illustrating color and finish.

C. Shop Drawings:

1. Show locations of reinforcements for compartment-mounted grab bars.
2. Show locations of centerlines of toilet fixtures.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

B. Include maintenance instructions and manufacturer’s list of replaceable parts and service recommendations.

C. Product Certificates: For each type of toilet compartment, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Inserts and Anchorages: Provide accessory Manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other Work to avoid delay.

D. Field Verification: Before start of installation of wall finishes, installer shall verify that required blocking has been installed in proper locations. Verify that installation of finishes and required anchoring devices are complete.

E. Industry Standards: Work shall comply with applicable provisions of the following:
1. OSHA Department of Labor CFR 29, section 1910.141: Sanitation.
2. ANSI A117.1 – Safety Standards for the Handicapped
3. ADA Accessibility Guidelines for Buildings and Facilities July 23, 2004 – Provisions for Children

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, and other construction contiguous with toilet compartments by field measurements before fabrication.

B. Coordinate accessory locations, installation, and sequencing with other Work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

C. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

D. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.10 WARRANTY

A. Toilet Accessory Warranty: Provide manufacturer’s one (1) year warranty from the Date of Substantial Completion, against defects in material and workmanship, unless otherwise indicated.

B. Mirror Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within fifteen (15) years from the Date of Substantial Completion.

1.11 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Regulatory Requirements: Comply with applicable provisions in the Department of Justice 2010 ADA Standards for Accessible Design.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Bobrick.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Georgia Pacific Corp.
   2. American Specialties ASI.
   3. Bradley Corporation.
   4. AJW Architectural Products.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Stainless Steel Tubing: ASTM A269/A269M, Type 304 or 316

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirror Glass: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

J. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

K. Galvanized Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.

L. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 FABRICATION

A. No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating Manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

2.4 KEYING

1. Supply four keys for each accessory to Owner.
2. Provide a master-key system for all accessories.

2.5 FINISHES

A. Galvanizing ASTM A123 to 1.25-oz/sq yd Galvanize ferrous metal and fastening devices.

B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.

C. Enamel: Pre-treat to clean condition, apply one-coat primer and minimum two-coat epoxy baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

E. Stainless Steel: No. 4 satin luster finish.

F. Back paint components where in contact with building finishes helping resist electrolysis.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to Manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F446.

D. Provide all items and accessories as required for a complete and total installation in every respect, whether or not specified or indicated on the drawings.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

3.3 SCHEDULE

A. Mirror (M1)
   1. Size: 24 inches x 36 inches.

B. Soap Dispenser (SD)
   1. Basis of Design Product: B-2013, Wall mounted.
   2. Stainless Steel w/ Satin Finish.

C. Paper Towel Dispenser (PTD)
   1. Basis of Design Product: B-262.
   2. Surface mounted.
   3. 4″D x 3/4″W x 14″H
   4. Stainless Steel w/ Satin Finish.

D. Toilet Tissue Dispenser (TTD)
   1. Basis of Design Product: B-6867.

2. Stainless Steel w/ Satin Finish.

E. Utility Shelf w/ Mop/Broom Holder and Rag Hooks (MOP)
1. Basis of Design Product: B239 x 34.
2. Size: 8”D x 13”H x 34"L.
3. Stainless Steel w/ Satin Finish.

F. Coat Hook (CH)
1. Locations: At back of toilet room doors.
2. Bobrick B-7672.
3. Stainless Steel W/ Satin Finish.

G. Grab Bars: See drawings for size locations.
1. Size: 18", Vertical (GB18).
2. Size: 36", Horizontal (GB36).
3. Size: 342", Horizontal (GB42).

H. General Notes
1. Soap dispenser to be secured to wall above lavatory with two screws. Exact location shall be indicated by Architect at the time of installation.
2. Coordinate the location of this dispenser so that no conflict occurs at either the wall mounted mirror above the lavatory or the cold water faucet assembly mounted on the deck of the lavatory.
3. Mop holder where indicated on drawings, shall be provided at each custodial sink and mounted at 60" AFF.

END OF SECTION

This page intentionally left blank

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Self-service reloadable fire extinguishers.

C. Fire blankets.

D. Fire extinguisher cabinets.

1.3 REFERENCE STANDARDS

A. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM B221 – Standard Specification for Aluminum-and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

D. FM (AG) - FM Approval Guide; Current Edition.

E. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

F. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinquishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Provide FM Approvals for the following:
   1. Multipurpose Dry Chemical Fire Extinguishers.

G. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.

C. Installer Qualifications: Shall be State of South Carolina certified.

D. Conform to NFPA 10 requirements for all portable fire extinguishers.

E. Provide fire extinguishers, cabinets, and accessories by single manufacturer.

F. The identification of the listing and labeling organization, the fire test, and the performance standard that the fire extinguisher meets or exceeds shall be clearly marked on each fire extinguisher.

1.7 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguisher cabinets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.

B. Warranty Period: Five (5) years from date of Substantial Completion.

1.9 PERFORMANCE

A. Performance: Fire extinguishers shall be UL-rated, fully charged and ready for emergency use when applicable per the International Building Code, the South Carolina Fire Prevention Codes, NFPA 10, the State Fire Marshall Office, and NFPA standards.

B. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. JL Industries, an Activar Construction Products Group, Inc. brand.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   2. Nystrom, Inc: www.nystrom.com/#sle.
   3. Oval Fire Products: www.ovalfireproducts.com/#sle.
   4. Amerex Corporation
   5. Ansul Incorporated
   6. Larsen's Manufacturing Company
   7. Potter-Roemer, a member of Morris Group International.
   8. Pyro-Chem, a division of Johnson Controls International: www.pyrochem.com/#sle.
   9. Self-Service Reloadable Fire Extinguishers:
   10. Rusoh, Inc: www.rusoh.com/#sle.
   11. Fire Extinguisher Cabinets and Accessories:
      a. JL Industries, an Activar Construction Products Group, Inc. brand: www.activarcpg.com/#sle.
      b. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.

c. Larsen's Manufacturing Co., a member of Morris Group International: www.larsensmfg.com/#sle.
d. Nystrom, Inc: www.nystrom.com/#sle.
e. Oval Fire Products: www.ovalfireproducts.com/#sle.
f. Potter-Roemer, a member of Morris Group International: www.potterroemer.com/#sle.

C. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 FIRE EXTINGUISHERS

A. Existing fire extinguisher for reuse:
1. Verify fire extinguisher is in good working order prior to installation. If not, notify Owner.

B. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

C. Water Type Fire Extinguishers: Stainless steel tank, pressurized, with premixed antifreeze solution, including hose and nozzle.

D. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C nominal capacity in enameled steel tank with pressure gauge size and classification as scheduled.

E. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C and 4-A:80-B:C nominal capacity in enameled steel tank with pressure gauge size and classification as scheduled.

F. Purple-K Dry-Chemical Type in Aluminum Container: UL-rated 2.5-lb nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.

G. Stored-Pressure Water-Mist Type: WM-Series UL-rated 2-A:C, 2.5-gal. nominal capacity, with water in enameled-steel container; with pressure-indicating gauge.

H. Provide additional types to comply with conditions.

I. Type A fire extinguishers shall be a minimum UL rated 2-A.

J. Extinguisher Finish:
1. Multi-purpose units: Provide heavy-duty, DOT steel cylinders with corrosion and impact resistant polyester/epoxy paint finish.
2. Gaseous and wet chemical units: Provide stainless steel, satin chrome finish.

K. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
1. Basis of Design Product: Cosmic 10E manufactured by JL Industries.
2. Cartridge Operated: Spun shell.
3. Stored Pressure Operated: Deep Drawn.
4. Class: A:B:C type.
5. Size: 10 pound (4.54 kg).
6. Finish: Baked polyester powder coat, red color.
7. Temperature range: Minus 65 degrees F (Minus 54 degrees C) to 120 degrees F (49 degrees C).

2.3 SELF-SERVICE RELOADABLE FIRE EXTINGUISHERS

A. Self-Service Reloadable Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
2. Self-Service Features:
a. Special license or certification not necessary for required monthly and annual inspections.

b. Depending upon authorities having jurisdiction (AHJ), special license or certification may be necessary for servicing and reloading.
c. Reloadable on site with extinguisher agent and carbon dioxide cartridges.

2.4 FIRE EXTINGUISHER CABINETS

A. General:
1. Size to accommodate indicated extinguisher and accessories.
2. Configuration: Semi-recessed type, per drawing details and locations, sized to accommodate required extinguishers, combination fire extinguisher cabinet and accessories.
3. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
1) Rolled Edge Trim: 2-1/2 inch backbend depth (semi-recessed) surface.

B. Doors
1. Door Style: Manufacturer’s standard design, as follows:
a. Vertical duo glazed panel with pull.
b. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
c. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.
d. Door Glazing: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape and set in resilient channel glazing gasket.
2. Door Construction: Fabricate doors according to manufacturer’s standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
a. Provide minimum 1/2 inch thick door frames, fabricated with tubular stiles and rails, and hollow metal design.
3. Fabrication: Weld, fill, and grind components smooth.
4. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
5. Finish of Cabinet Interior: White enamel.
6. Hinge doors for 180° opening with continuous piano hinge.
a. Provide nylon self-adjusting roller catch.
b. Provide recessed door pull.
7. Glaze doors with resilient channel gasket glazing.

C. Standard Cabinet Construction:
1. Non-fire-resistance-rated.
2. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.

D. Fire-Resistance-Rated Cabinet Construction:
1. Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
2. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.

E. Cabinet Configuration: Fully-Recessed.
1. Trim: None.
2. Trim: Flat trim.

F. Cabinet Configuration: Partially-Recessed.
1. Trim: Flat square edge.

G. Cabinet Configuration: Surface Mounted.
1. Trim: None.

2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

2.5 FIRE BLANKET CABINET

A. Drop-Type Fire Blanket Cabinet
   1. Basis of Design Product: Royal Series Model 9613S21 as manufactured by J.L. Industries.
   2. Cabinet:
      a. Material: Metal tub and door painted with red epoxy paint and white vinyl letters indicating “FIRE BLANKET”. Hardware to be zinc-plated.
      b. Mounting: Surface

B. Roller-Type Fire Blanket Cabinet:
   1. Basis of Design Product: Royal Series Model 9519S21 as manufactured by J.L. Industries.
   2. Cabinet:
      a. Material: Metal tub and door painted with red epoxy paint and white vinyl letters indicating “FIRE BLANKET”. Hardware to be zinc-plated.
      b. Mounting: Surface.

2.6 ACCESSORIES

A. Fire Blanket: Fire retardant treated wool; red, 62 by 84 inch (1575 by 2135 mm) size complying with 16 CFR 1610..

B. Extinguisher Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

C. Extinguisher Theft Alarm: Battery operated alarm, 10 second delay for disarming, activated by opening cabinet door.
   1. Location(s): Provide at each fire extinguisher cabinet

D. Cabinet Signage:
   1. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).
      a. Location: Applied to cabinet door.
      b. Application Process: Pressure-sensitive vinyl letters.
      c. Lettering Color: Red.
      d. Orientation: Vertical

E. Floor Signs:
   1. Floor Sign: 17-1/2 inch (445 mm) diameter vinyl sign with "DO NOT BLOCK FIRE EXTINGUISHER", directional arrow, and fire extinguisher icon.
   2. Manufacturers:
      a. Manufacturers shall be one of the following. However products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
         1) Brimar Industries, Inc; www.brimar.com/#sle.
         2) Insite Solutions, LLC; www.stop-painting.com/#sle.
      b. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

F. Floor Marking Kits:
   1. Floor Sign: 17-1/2 inch (445 mm) diameter vinyl sign with "FIRE EXTINGUISHER", directional arrow, and fire extinguisher icon.

2. Manufacturers:
   a. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
      1) Insite Solutions, LLC; www.stop-painting.com/#sle.
   b. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

G. Self-Service Reloading Kits: Type ABC.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire Protection Cabinets: 48 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Provide inside latch.
   2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

D. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

E. Recharge existing fire extinguisher for units that are indicated to remain, replace if recharging is not possible.

F. Provide occupancy hazard protection with fire extinguishers suitable for such Class A, B, C, D, or K fire potentials as might be present. Class K shall be provided in all food preparation areas.

G. Install fire extinguishers in accordance with NFPA 10.

H. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

I. Install cabinets plumb and level in wall openings in strict accordance with NFPA 10, the original design, the approved Shop Drawings and the manufacturer's recommended installation procedures as approved by the Architect and authorizing agencies, anchoring all components firmly into position for long life under hard use.
   1. Secure rigidly in place.

J. Do not install extinguishers until Substantial Completion inspection date.

K. Place extinguishers and accessories in cabinets.

L. Place extinguishers and accessories in cabinets or on wall brackets.

M. Inspection tags shall be current as of the date of Substantial Completion and good for 1-year.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturers written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
   1. Provide one Multipurpose Fire Extinguisher with wall bracket in each of the following locations:
      a. Mechanical Rooms.
      b. Electrical Rooms.
   2. Provide one Class K Fire Extinguisher with wall bracket in kitchen.

3.4 MAINTENANCE

A. Refer to Section 01 77 00 - Closeout Procedures for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

3.5 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

END OF SECTION

This page intentionally left blank

SECTION 10 75 00 - FLAGPOLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Ground-mounted flagpoles made from aluminum.
   2. Flagpole light.
   3. Accessories.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

G. AASHTO M246/M246M – Standard Specification for steel sheet, metallic-coated and polymer pre-coated for corrugated steel pipes.

H. ASTM A790/A790M – Standard Specification for Seamless and Welded Ferrite/Austenitic Stainless-Steel Pipe.

I. CDA (Copper Development Association) – Handbook.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Provide product data on pole, accessories, and configurations.

B. Shop Drawings: Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
   1. Include section, and details of foundation system for ground-mounted flagpoles.
   2. Provide engineered shop drawings indicate detailed dimensions, base details, anchor requirements, and imposed loads.

C. Delegated-Design: Provide design services, calculations and shop drawings for delegated design requirements complying with code requirements, performance requirements and design criteria signed and sealed by an engineer registered in the State of South Carolina.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

1.8 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
   1. Wind Loads: As indicated on structural drawings and in compliance with IBC and ASCE 7.
   2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

B. Delegated-Design: Provide design services, calculations and shop drawings for delegated design requirements complying with code requirements, performance requirements and design criteria signed and sealed by an engineer registered in the State of South Carolina.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers shall be one of the following. However products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. American Flagpole; a Kearney-National Inc. company.
   2. Eder Flag Manufacturing Company, Inc.
   3. U.S. Flag & Flagpole Supply, LP.
   4. Concord Industries, Inc.
   5. Pole-Tech Co., Inc.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
   1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
   2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height: 30 feet (914.4 cm).

C. Aluminum Flagpoles: Provide one-piece cone tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.76 mm).

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel to G90 after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
   1. Provide flashing collar of same material and finish as flagpole.
   2. Interior Finish: Treat the interior to prevent corrosion.
   3. Lightning Ground Rod: Copper 3/4" diameter rod of a designed length for grounding.

E. Cast-Metal Shoe Base: Provide units made from aluminum with same finish and color as flagpoles. For anchor-bolt mounting; provide with anchor bolts.

F. Flagpole Interior Finish: Treat the interior to prevent corrosion.

G. Quantity: One (1) Two (2) poles.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard 6” diameter spun aluminum flush-seam ball, match flagpole-butt diameter and with gold anodic finish.
   1. 0.063-inch spun aluminum with gold anodic finish.

B. External Halyard, Cam Cleat System: Continuous 3/8 inch (9.52 mm) diameter, white braided polypropylene halyard; cam cleat; and non-foiling revolving truck assembly of cast aluminum material with stainless steel ball bearings and with plastic-coated counterweight and sling.
   1. Provide external 9" cast aluminum cleat with fasteners with aluminum cleat cover box with built-in hinge and secured with cylinder lock. Finish truck assembly to match flagpole. Mount 28” above grade.
   2. Halyard Covers: 2" channel, 60 inches (1524 mm) long, finish to match flagpole.

C. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

D. Halyard Flag Snaps: Provide four stainless steel swivel snap hooks per halyard to accommodate two flags, provide with neoprene or vinyl covers.

2.4 FLAGS

A. Provide one USA flag, 8 x 5 feet (152.4 cm) size, nylon fabric, brass grommets, and hemmed edges.

B. Provide one South Carolina State flag, 8 x [5] feet ([152.4] cm) size, nylon fabric, brass grommets, and hemmed edges.

2.5 LIGHTING

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Concord American.
      a. Basis of Design Product: “American Beacon Internal Halyard Beacon Dual Light #ABW2-##4P-SAT”.
   2. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

B. Size: 8" diameter

C. Lumens: 572

D. Finish: Satin

2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Provide Type 316 stainless-steel fasteners for exterior use.

B. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107.

C. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

D. Sand: ASTM C 33, fine aggregate.

E. Elastomeric Joint Sealant: Single-component neutral- and basic-curing silicone joint sealant complying with requirements in specification section "Joint Sealants" for Use NT (non-traffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum
   1. Flagpole Finish: Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0 inch (0.01 mm) or thicker.
   2. Finial Ball Finish: Gold Anodic Finish: AAMA 611, AA-M32C22A43 Class I, 0 inch (0.02 mm) or thicker; gold color.

D. Steel Finishes
   1. Flagpole Interior Finish: Apply one coat of bituminous paint on interior of flagpole or otherwise treat to prevent corrosion.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Place concrete, as specified in specification section "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use non-staining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.

C. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and

remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

D. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with non-shrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION

This page intentionally left blank

SECTION 11 31 00 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Appliances
   2. Provide accessories and necessary mechanical and electrical connections as shown on the plans, specified, and as required for complete operating systems.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Submit shop drawings and manufacturer literature including the model number, material, finishes, and details of construction and installation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of appliance.

C. Field quality-control reports.

D. Sample Warranties: For manufacturers' special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Certification Labels: Provide residential appliances which complies with standards and bears certification labels as follows:
   1. Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.
   2. UL Standards: Provide residential appliances with UL labels.
   3. Uniformity: Provide residential appliances by single manufacturer to the greatest extent possible for the entire project.

B. An installer who has a minimum of five (5) years experience in the field, and can demonstrate successful completion of similar projects must perform installation of specified work.

C. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

E. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.

F. AHAM Standards: Provide appliances that comply with the following AHAM standards.

1.9 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranties: Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
   1. Microwave: Five (5) year limited warranty.
   2. Refrigerator/Freezer: Five (5) year limited warranty on the sealed refrigeration system.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer shall be one of the following however products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding:
   1. Samsung
   2. General Electric
   3. Hotpoint
   4. LG Electronics
   5. Maytag
   6. Speed Queen
   7. Whirlpool
   8. Insinkerator

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

C. All products shall be ADA compliant and installed to meet code requirement.

2.2 EQUIPMENT SCHEDULE

A. Microwave: Cabinet mounted.

B. Refrigerator: Top mount ref.

2.3 MATERIALS

A. The use of Energy Star products is required over non-energy star products when available.

B. Provide appliance in the number, location, and type shown on the plans.

C. Provide appliance in the number, location, and type shown on the plans and from the Residential Equipment Schedule acceptable standards.

2.4 ACCESSORIES

A. Provide all ductwork, termination caps, and accessories as required by each manufacturer to complete the install of each unit as shown on the drawings.

B. Coordinate electrical accessories required for complete installation.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust and microwave ovens with vented exhaust fans will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
   2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After installation, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

This page intentionally left blank

SECTION 12 24 94 - ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 01, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Manual operating single-roller shades.

1.3 REFERENCE STANDARDS

A. ASTM E84 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

B. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. CPSC – U.S. Consumer Product Safety Commission.

D. NFPA 701-99 – Fire Tests for Flame-Resistant Textiles and Films.

E. WCSC – Window Covering Safety Council.

F. ANSI/WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 SUBMITTALS

A. Submit Environmental Certification and Third-Party Evaluation per Section 1.5 Qualifications.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
   1. Prepare shop drawings on Revit, AutoCAD or MicroStation format using base sheets provided electronically by the Architect.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty (20) years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten (10) years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.9 WARRANTY

A. Roller Shade Hardware, and Shadecloth: Manufacturer's standard non-depreciating twenty-five (25) year limited warranty from date of Substantial Completion.

B. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. MechoShade Systems, Inc.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Draper Inc.
   2. Hunter Douglas Contract.
   3. Lutron Electronics Co., Inc.

2.2 BLINDS

A. Basis of Design Product: “Mecho 5” Light Filtering or Light Blocking as indicated.

B. Roller type: Single roller, manually operated.

C. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Stainless steel.
      a. Loop Length: Full length of roller shade except at clerestory windows where chain will stop 48” inches above finished floor, to be verified with the Architect.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer Type: Standard Clip
   2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
      a. Provide for shadebands that weigh more than 12 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

D. Rollers: Corrosion-resistant extruded-aluminum tubes of diameters and wall thicknesses required for accommodating operating mechanisms and weights and widths of shadebands indicated

without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As indicated on drawings.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

1. Brackets: Constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
2. Plastics: Provide self–lubricating plastic for all plastic components of shade hardware.

F. Shadebands:

1. Shadeband Material: Light filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
3. Type: Enclosed in sealed pocket of shadeband material.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
2. Shape: L-shaped.
3. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open.
4. Endcap Covers: To cover exposed endcaps.
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

H. Location: See drawings for blind locations.

2.3 LOCATION

A. Location: Provide blinds at as indicated on drawings.

2.4 SHADE CLOTH

A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., SoHo "1100" and "1900" Series.

1. Content: 76% PVC and 24% Polyester.
2. Woven yarn pattern: Basket weave.
3. Screen fabric openess factor:
   a. 1100 Series: 1% surface area perforation.
   b. 1900 Series: 5% surface area perforation.
4. Texture: Smooth.
5. Fire Classification: NFPA 701.
6. Bacterial and Fungal Resistance: ASTM G21 & ASTM E2180.
7. Acoustic Performance:
   a. 1100 Series: 0.60 NRC/0.64 SAA.
   b. 1900 Series: negligible.
8. Mesh Weight:
   a. 1100 Series: 14.70 oz/yd2.
   b. 1900 Series: 12.68 oz/yd2.
9. Fabric thickness:
   a. 1100 Series: 0.026 inch.
   b. 1900 Series: 0.024 inch.
10. Color: See drawings for color selections.

2.5 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

2.6 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.

2.7 COMPONENTS

A. Access and Material Requirements:
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Fixed Shade Hardware and Brackets:
   1. Provide hardware capable for installation of a removable fascia, which shall be installed without exposed fastening devices of any kind.
   2. Provide shade hardware system that allows for removable fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
   3. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

2.8 FABRICATION

A. Product Safety Standard: Fabricate shades to comply with ANSI/WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Determine sizes by field measurement.

C. Fabricate shades to fit within openings with uniform edge clearance of 1/8 inch (3 mm).

D. At openings requiring multiple shade units, provide separate shade assemblies with space of 1/4 inch (6 mm) between blind shades, located at window mullion centers.

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.

B. Install fixed shades to fully fit window opening from head to sill and jamb to jamb.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

This page intentionally left blank

SECTION 12 36 61.0 - SOLID SURFACING COUNTERTOPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Solid surfacing countertops.
   2. Accessories.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. PS 1 - Structural Plywood; 2023.

C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data: Provide date for materials indicated and manufacturer's installation instruction.

B. Shop Drawings: Indicate profiles of units, jointing, fastening, edge treatments, and cut-outs for sinks, accessories, and related items.

C. Samples: Submit the following:
   1. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches (254 mm) of construction and in configuration specified.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.

B. Fabricator Qualifications: Manufacturer who fabricates countertops similar to work of this Project and have a minimum five (5) years experience.

C. Fire Test response Characteristics:
   1. Provide with the following Class A (Class 1) surface burning characteristics as evidenced by testing identical products against ASTM E84 (UL 723) or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Flame Spread Index: 25 or less.
   3. Smoke Developed Index: 450 or less.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication.

B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.9 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Manufacturer's warranty period:
   1. Ten (10) years from date of substantial completion.

1.10 PERFORMANCE

A. Fire Test Response Characteristics:
   1. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Flame Spread Index: 25 or less.
      b. Smoke Developed Index: 450 or less.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Refer to drawings for finish selections.

B. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product:
   1. Wilsonart.
   2. Samsung Staron
   3. Corian by Dupont Company

2.2 MATERIAL

A. Solid polymer components
   1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
   2. Superficial damage to a depth of 0.010 inch (0.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness: 1/2"

C. Countertop Edge Treatment: Selected by Architect. Eased.

D. Countertop Edge Treatment: Selected by Architect. Laminated bullnose

E. Countertop Final Edge Thickness: 1 1/2" laminated

F. Backsplash and Sidesplash: 1/2" thick, Eased at the top and exposed sides

G. Backsplash and Sidesplash: 3/4" thick with 3/8" radius at the top and exposed sides

H. Backsplash and Sidesplash Height: 4" high and as indicated on the drawings.

2.3 ACCESSORIES

A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

B. Joint adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

C. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant, UL-listed silicone sealant in colors matching components.

D. Sink mounting hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks.

E. Sink/lavatory mounting hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.

F. Conductive tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

G. Insulating felt tape: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 FACTORY FABRICATION

A. Shop assembly all components possible.

B. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.

C. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Reinforce with strip of solid polymer material, 2" wide.

D. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings. Reinforce with strip of solid polymer material, 2" wide.

E. Fabricate integral sinks as indicated.

F. Rout and finish component edges with clean, sharp returns.
   1. Rout cutouts, radii, and contours to template.
   2. Smooth edges.
   3. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Color: Submit color selection to Architect for approval prior to installation.

B. Finish:
   1. Provide surfaces with a uniform finish.
      a. Semi-gloss: Gloss range of 20–50, to be verified by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
   1. Flat and true to within 1/8" of a flat surface over a 10' length.
   2. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.

B. Provide product in the largest pieces available.

C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
   1. Exposed joints/seams shall not be allowed.

D. Reinforce field joints with solid surface strips extending a minimum of 1 inch (25.4 mm) on either side of the seam with the strip being the same thickness as the top.

E. Cut and finish component edges with clean, sharp returns.

F. Rout radii and contours to template. Seal edges of cutouts in plywood by saturating with varnish.

G. Anchor securely to base cabinets or other supports.

H. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.

I. Carefully dress joints smooth, remove surface scratches and clean entire surface.

J. Applied backsplashes and applied sidesplashes:
   1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
   2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to Architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.

B. Remove adhesives, sealants, and other stains.

END OF SECTION

SECTION 12 36 61.19 - QUARTZ SURFACING COUNTERTOPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Quartz agglomerate surfacing countertops.
   2. Quartz agglomerate backsplashes.
   3. Quartz agglomerate endsplashes.
   4. Adhesives and sealants.

1.3 REFERENCE STANDARDS

A. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser; 2021.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ISO 9001 - Quality Management Systems — Requirements; 2015.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

H. ASTM C 97: Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.

I. ASTM C 170: Standard Test Method for Compressive Strength of Dimension Stone.

J. SCAQMD (South Coast Air Quality Management District) Rule 1168: Adhesive and Sealant Applications.

1.4 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.5 ACTION SUBMITTALS

A. Product Data:
   1. Submit product data for each specified product. Include manufacturer’s technical data sheets and published instruction instructions.
   2. Submit Safety Data Sheets (SDS) for adhesives and sealants.
   3. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
   4. LEED Submittals: Submit applicable LEED documentation for potential credits specified in this Section.

B. Shop Drawings:
   1. Submit fully dimensioned shop drawings showing countertop layouts, backsplashes, endsplashes, joinery, edge conditions, terminations, substrate construction, cutouts and

holes. Show plumbing installation provisions. Include elevations, section details, and large scale details.

C. Samples:
   1. Submit full range of available colors and aggregates for selection purposes for Architect's selection. After initial selection, two sets, minimum 4" x 4", for each color for acceptance before proceeding with Work.

D. Warranty: Specimen copy of specified warranty.

1.6 INFORMATIONAL SUBMITTALS

A. Maintenance Data: Submit manufacturer's published Care & Maintenance manual with closeout submittals.

1.7 QUALITY ASSURANCE

A. Manufacturing Facility Qualifications: Quartz surfacing materials produced in an ISO 9001 certified facility.

B. Fabricator Qualifications: Minimum of five years documented experience in fabricating quartz surfacing countertops similar in scope and complexity to this Project, using water-cooled cutting tools. Currently certified by the manufacturer as an acceptable fabricator.

C. Installer Qualifications: Minimum of five years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

1.8 PERFORMANCE REQUIREMENTS

A. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Flame Spread Index: 25 or less.
   2. Smoke Developed Index: 450 or less.

1.9 MOCK-UPS

A. Install at Project using acceptable products and manufacturer approved installation methods. Obtain Architect's acceptance of color, pattern, finish, fabrication, and installation standards.

B. Mock-Up Size: As directed by Architect.

C. Mock-Up Location: As directed by Architect.

D. Maintain mock-up during construction for fabrication and installation comparison. If required, remove and legally dispose of mock-up when no longer required.

E. Incorporation: If permitted by Architect, mock-up may be incorporated into as part of the completed Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Comply with manufacturer's recommendations for shipping and handling quartz surfacing materials to preclude breakage or damage. Brace quartz surfacing units as necessary during shipment, transporting in near-vertical position with finished face towards finished face. Do not allow finished surfaces to rub during shipping and handling.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store quartz surfacing sheet materials on racks in near-vertical position to preclude damage. Store with finished face turned towards finished face. Prevent warpage and breakage.

1.11 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements and 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.

B. Adhesive: Acclimate adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.12 WARRANTY

A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial and Residential Limited Warranty against defects in quartz surfacing sheet materials.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer and basis of design shall be the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. Wilsonart LLC; 2501 Wilsonart Drive, Temple, TX 76504. Tel. 254.207.7000, Toll-Free 800.433.3222, Fax 254.207.2384, www.wilsonart.com.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 25 13.0 – Substitution Procedures regarding requirements of substitutions to be considered.

2.2 QUARTZ SURFACING SHEET MATERIAL (SS1)

A. Basis of Design Product: "Wilsonart Quartz."

B. Composition: Up to 93 percent quartz aggregate combined with polyester resin binders and proprietary pigments that are fabricated into slabs using vacuum vibrocompaction technology.

C. Dimensions:
   1. Thickness: 1.18 inches (3 cm).
   2. Size: Slabs shall be not less than 55 inches by 120 inches long to minimize the number of joints used in installation.
   3. Seam Width: <1/8 inches
   4. Backsplash: 4" high or as indicated on drawings.

D. Material Weight: 15 lbs/ft^2

E. Identification: Material shall be labeled with a batch number and imprinted with a manufacturer's identifying mark on the back.

F. Color: See drawings for color selection.

G. Finish: Polished finish with Glossometer reading greater than 45.

H. Exposed Edges and Corners Shapes: As selected by the Architect.

I. Sink Mounting: Under mount or as indicated on drawings.

J. Flexural Strength: Greater than 4,500 psi; ASTM D 790.

K. Flexural Strain: Less than 0.375 percent; ASTM D 790.

L. Flexural Modulus: Greater than 3.75 MPsi; ASTM D 790.

M. Stain Resistance (24 Hour): No effect to moderate effect; NEMA LD-3.

N. Abrasion Resistance: Greater than 100 in.-lbs.; ASTM C 501.

O. Density: Greater than 2.1 g/cm3; ASTM C 97.

P. Compressive Strength (One Axis - Dry): Greater than 20,000 psi; ASTM C 170.

Q. Moisture Absorption: Maximum 0.022 percent; ASTM C 97.

2.3 ACCESSORIES

A. Joint Adhesive: Methacrylate-based adhesive for chemically bonding quartz surfacing seams. Color complementary to quartz surfacing sheet material.
   1. Basis of Design Product: “Wilsonart Hard Surface Adhesive.”
   2. Other Acceptable Products: Pigmented knife grade adhesives suitable for use with quartz surfacing are also acceptable.
   3. Color: Adhesive that will be visible in finished work should be tinted to match quartz surfacing.

B. Construction Adhesive: Countertop manufacturer’s recommended silicone-based construction adhesive for backsplashes, endsplashes, and other applications according to manufacturer’s published fabrication instructions.
   1. Color: Adhesive that will be visible in finished work should be tinted to match quartz surfacing.

C. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications.
   1. Basis of Design Product: Acceptable to countertop manufacturer.
   2. Color: As selected from sealant manufacturer’s standard offerings.

D. Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates.
   1. Basis of Design Product: “Wilsonart Color Matched Caulk”.
   2. Color: Selected from sealant manufacturer’s standard offerings.
      a. [Complementary to solid surfacing color] [Clear] [Selected from sealant manufacturer’s standard offerings]

E. Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.

F. Cleaning Agents: Non-abrasive, low pH cleansers.

G. Sink/bowl mounting hardware:
   1. Manufacturer’s approved bowl clips, brass inserts, and fasteners for attachment of undermount sinks/bowls.

2.4 FABRICATION

A. Inspect Material:
   1. Inspect material for defects prior to fabrication.
   2. Color Match:
      a. Materials used throughout the project shall be from the same batch and bear labels with the same batch numbers.
      b. Visually inspect materials to be used for adjacent pieces to ensure acceptable color match.
      c. Inspect in lighting conditions similar to those existing at the jobsite.
   3. Variation in distribution of aggregates in quartz surfacing that is within manufacturer’s tolerances is not a defect.

B. Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart Quartz Fabrication Manual.

C. Allowable Tolerances:
   1. Variation in component size ± 1/8” over a ten (10) foot length.
   2. Location of openings: ± 1/8” from indicated location.
   3. Maximum 1/8” clearance between quartz surfaces and each wall.

D. Provide holes and cutouts for plumbing fixtures and accessories indicated on approved shop drawings. Rout cutouts and finish edges smooth, with clean, sharp returns.

1. Rout cutouts, radii, and contours to template.
2. Smooth and polish edges.

E. Polish edges where they will be exposed in finished work.

F. Layout: Layout joints to minimize joints.

G. Form joint seams between quartz surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

H. Provide 1-1/2" thick solid support brackets as indicated on the plan. Fabricate from two 3/4" thick pieces of material adhered back to back to provide finish surface on both exterior sides.

I. Fabricate components, including integral backsplashes and side splashes, to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with work in accordance with Specifications.

B. Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.

C. Confirm that supporting construction is complete, and is level, square, true, rigid, and secure.

D. Commencement of work will constitute acceptance of substrates and conditions to receive the work.

3.2 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
1. Flat and true to within 1/8" of a flat surface over a 10' length.
2. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.

B. Provide product in the largest pieces available.

C. Install quartz surfacing components plumb, level, and true according to approved shop drawings and manufacturer's published installation instructions. Use woodworking and specialized fabrication tools acceptable to manufacturer.

D. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
1. Exposed joints/seams shall not be allowed.
2. Joint widths no greater than 1/8" in finished work.
3. Keep components and hands clean when making joints.
4. Seams in locations shown on approved shop drawings and acceptable to manufacturer.
5. Clamp or brace quartz surfaces in position until adhesive sets.
6. Promptly remove excess adhesive.
7.

E. Fill gaps between countertop and terminating substrates with specified silicone sealant.

F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

G. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.

H. Cut and finish component edges with clean, sharp returns.

I. Rout radii and contours to template. Seal edges of cutouts in plywood by saturating with varnish.

J. Fasten quartz surfacing components to base cabinets or other supporting substrates with suitable adhesives acceptable to manufacturer.

K. Anchor securely to base cabinets or other supports.

L. Sinks: Adhere undermount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.

M. Applied backsplashes and applied sidesplashes:
   1. Install backsplashes and endsplashes where indicated on Drawings.
   2. Adhere to countertops with specified construction adhesive.
   3. Install using manufacturer's standard color-matched silicone sealant.

N. Vanities: Secure front panels to solid substrate with specified construction adhesive.
   1. ADA Vanities: Angled front to permit wheelchair access to comply with referenced accessibility standard.

3.3 REPAIRS

A. Minor surface marring for quartz surfacing components may be repaired according to manufacturer's published installation instructions.

B. Remove and replace quartz surfacing components that are damaged and cannot be satisfactorily repaired.

3.4 CLEANING AND PROTECTION

A. Clean and repair surfaces soiled or otherwise damaged in connection with work of this section.

B. Keep installed work clean as work progresses.

C. Clean quartz surfacing components according to manufacturer's published maintenance instructions.
   1. Clean by moderate use of a ph balanced neutral cleaner acceptable by manufacturer.
   2. Completely remove excess adhesives and sealants from finished surfaces.

D. Leave clean and free from blemishes.

E. Sealer Application: Apply sealer to countertop to comply with sealer manufacturer's instructions.

F. Protect completed work from damage during remainder of construction period.

END OF SECTION

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data

Project name: Turbeville Branch Library			
Location in South Carolina:	Address (street # & name): 1178 Smith Street		State Project: ☐ Yes ■ No
	City: Turbeville	County: Clarendon	State Project #:

Water Supply Information

(Flow test data must be less than 1 year old per §40-10-250(A)(1))

Date test conducted: / /	Static pressure (psi): TBD	Residual pressure (psi): TBD	Flow (gpm): TBD
Distances of test gauges relative to the base of the riser:	Horizontal (ft): 300	Vertical (elevation difference in ft): 0	
Source of water supply:	☐ Municipal dead-end ■ Municipal circulation ☐ existing fire pump ☐ Other:		Pipe Size (in.): 6
Test data by/from:	Name: Ellis Evans	Title:	
	Organization: Turbeville Water Department		Phone: 843-373-9273
Fire pump: ☐ New ☐ Existing ■ No Pump	Rated Pressure (psi):	Churn Pressure (psi):	
	Rated Capacity (gpm):	Pressure @ 150% flow (psi):	
On-site water storage:	☐ Yes ■ No ☐ New ☐ Existing	☐ Tank ☐ Other:	Capacity (gal):

NFPA Hazard Classification

(Attach continuation page when necessary)

Area #	Hazard Class or Code Reference	Description of Hazard Protected (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
1	Light Hazard	Office, Workroom, Kitchen, Restrooms, Lobby, Meeting Room
2	Ordinary Hazard, Group 1	Electrical Rooms, Storage Rooms
3	Ordinary Hazard, Group 1	Attic Spaces

Design Parameters

(Attach continuation page when necessary)

Area #	System Type	Density(gpm/ft²)/Area(ft²), or Other (Reference code sections)	Inside Hose (gpm)	Outside Hose (gpm)
1	Wet	0.10 gpm/sf/1500 sf *	0	100
2	Wet	0.15 gpm/sf/1500 sf *	0	250
3	Wet	0.15 gpm/sf/1950 sf	0	250

Seismic Design Data:	S_S= 0.55g	**Site Classification**= D	**Seismic Design Category**= D

Codes and Standards

(Attach continuation page when necessary)

Applicable Codes, Standards, & Editions (i.e. 2018 IBC, 2016 NFPA 13, etc.) **for the Scope of Work on the Fire Sprinkler System**

Wet Pipe Sprinkler System: NFPA-13 (2019), , IBC (2021), IFC (2021)

* Area reduction per 19.3.3.2.3.2 is allowed

Scope of work (i.e. sprinkler system A.G. from 1'-0" A.F.F., U.G. from tap to 5'-0" outside, etc.) and **notes** (attach continuation page when necessary):

- Fire sprinkler contractor's work begins 1'-0" above finished floor at the riser.

Specifier's Information

Name: Samuel C. Stephens, P.E.	
Engineering services provided through a firm: ■ Yes ☐ No	
Firm name: Stephens Engineering & Consulting, LLC	
Address: 130 Heritage Lane	
City: Easley	
State: SC Zip: 29642	
Phone: 864-414-1965 Fax:	
E-mail: sam@stephensec.com	

SOUTH CAROLINA — STEPHENS ENGINEERING & CONSULTING LLC — C05169 — CERTIFICATE OF AUTHORIZATION

Certificate of Authorization

SOUTH CAROLINA — REGISTERED PROFESSIONAL ENGINEER — NO. 16685 — SAMUEL C. STEPHENS — 6-5-2025

Professional Engineer's Seal

Revision No.: 0

Page 1 of 1

Signature: Samuel C Stephens

Date: 6-5-2025

Form Version: July 1, 2021

This page intentionally left blank

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Plumbing demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical 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 mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and 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.

F. The following are industry abbreviations for plastic materials:
1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 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.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. 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 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.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
   1. Manufacturers:
      a. Cascade Waterworks Mfg. Co.
      b. Dresser Industries, Inc.; DMD Div.
      c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
      d. JCM Industries.
      e. Smith-Blair, Inc.
      f. Viking Johnson.
   2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
   3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
   4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
   1. Manufacturers:
      a. Eslon Thermoplastics.
      b. Prior Approved Equal

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
   1. Manufacturers:
      a. Thompson Plastics, Inc.
      b. Prior Approved Equal

D. Plastic-to-Metal Transition Unions: MSS SP-107, PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
   1. Manufacturers:
      a. NIBCO INC.
      b. NIBCO, Inc.; Chemtrol Div.

2.5 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 minimum working pressure at 180 deg F.
   1. Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Eclipse, Inc.
      d. Epco Sales, Inc.
      e. Hart Industries, International, Inc.
      f. Watts Industries, Inc.; Water Products Div.

g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch 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.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 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 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type with spring clips.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
      f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
      i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
      c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
         1) Seal space outside of sleeve fittings with grout.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches 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.

R. 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 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.

S. 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 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. 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.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. 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 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 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 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 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, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 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.

3.8 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.

3.9 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.

END OF SECTION 22 05 00

This page intentionally left blank

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 fire-suppression piping Sections for pipe hangers for fire-suppression piping.
3. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.
8. Paint Coating: Epoxy.
9. Plastic Coating: Polyester.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 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.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal 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 the building structure.

B. Metal 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 for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick 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.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

I. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

L. 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.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2and 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.

O. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

Q. Insulated Piping:

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 allowed by 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.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 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 bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 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/D1.1M 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 so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. 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 noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. 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 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. 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 for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. 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. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. 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.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. 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.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 53 - 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 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.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
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 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: Precoiled, 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 high.

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. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:

a. Background Color: Green
b. Letter Color: Black.

2. Domestic Hot Water Piping:

a. Background Color: Yellow
b. Letter Color: Black.

3. Roof Drain Piping:

a. Background Color: Green.
b. Letter Color: Black.

END OF SECTION 22 05 53

This page intentionally left blank

SECTION 22 07 00 - PLUMBING 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:

1. Insulation Materials:
   a. Flexible elastomeric.
   b. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.

B. Related Sections include the following:
1. Division 23 Section "HVAC Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

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. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sample Sizes:

a. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
b. Sheet Form Insulation Materials: 12 inches square.
c. Jacket Materials for Pipe: 12 inches long by NPS 2.
d. Sheet Jacket Materials: 12 inches square.
e. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

D. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. 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: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Armacell LLC; AP Armaflex.
   b. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. 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 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 Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

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 and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:
a. Armacell LCC; 520 Adhesive.
b. Foster Products Corporation, H. B. Fuller Company; 85-75.
c. RBX Corporation; Rubatex Contact Adhesive.

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).

C. 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).

D. 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).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

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 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.

3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.
f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

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. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

C. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard; Insulrap No Torch 125.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.

c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. 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 equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

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 Division 07 Section "Penetration Firestopping"irestopping 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 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

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.

3.7 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 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, 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.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. 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 pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, 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.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

3.12 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.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed in Mechanical or Storage Rooms:
1. Aluminum, Stucco Embossed: 0.032 inch thick.

END OF SECTION 22 07 00

SECTION 22 11 16 - DOMESTIC WATER PIPING

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. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Encasement for piping.
3. Specialty valves.
4. Flexible connectors.
5. Escutcheons.
6. Sleeves and sleeve seals.
7. Wall penetration systems.

1.3 SUBMITTALS

A. Product Data: For the following products:
1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.
5. Water meters.
6. Backflow preventers and vacuum breakers.
7. Escutcheons.
8. Sleeves and sleeve seals.
9. Water penetration systems.

B. Water Samples: Specified in "Cleaning" Article.

C. Field quality-control reports.

1.4 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. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 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. Under-building-slab, domestic water, building service piping, NPS 3 and smaller, shall be the following:
   1. Hard copper tube, ASTM B 88, Type K; wrought- copper solder-joint fittings; and soldered or press fit joints (Viega Pro-Press).

C. Aboveground domestic water piping shall be the following:
   1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered or press fit joints (Viega Pro-Press).

2.2 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.

2.3 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L 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.
   5. Copper Pressure-Seal-Joint Fittings:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Elkhart Products Corporation; Industrial Division.
         2) NIBCO INC.
         3) Viega; Plumbing and Heating Systems.
      b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
      c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch 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.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Form: Tube.

C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

D. Color: Natural.

2.6 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.7 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cascade Waterworks Manufacturing.
      b. Dresser, Inc.; Dresser Piping Specialties.
      c. Ford Meter Box Company, Inc. (The).
      d. JCM Industries.
      e. Romac Industries, Inc.
      f. Smith-Blair, Inc; a Sensus company.
      g. Viking Johnson; c/o Mueller Co.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Flex-Hose Co., Inc.
   2. Flexicraft Industries.
   3. Flex Pression, Ltd.
   4. Flex-Weld, Inc.
   5. Hyspan Precision Products, Inc.
   6. Mercer Rubber Co.
   7. Metraflex, Inc.
   8. Proco Products, Inc.
   9. Tozen Corporation.
   10. Unaflex, Inc.
   11. Universal Metal Hose; a Hyspan company

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
   1. Working-Pressure Rating: Minimum 200 psig.
   2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
   3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.9 ESCUTCHEONS

A. Refer to Specification 220500.

2.10 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

G. 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 setscrews.

2.11 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. 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: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.12 WALL PENETRATION SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. SIGMA.

B. Description: Wall-sleeve assembly, consisting of housing and gland, gaskets, and pipe sleeve.
1. Carrier-Pipe Deflection: Up to 5 percent without leakage.
2. Housing: Ductile-iron casting with hub, waterstop, anchor ring, and locking devices. Include gland, bolts, and nuts.
3. Housing-to-Sleeve Gasket: EPDM rubber.
4. Housing-to-Carrier-Pipe Gasket: AWWA C111, EPDM rubber.
5. Pipe Sleeve: AWWA C151, ductile-iron pipe or ASTM A 53/A 53M, Schedule 40, zinc-coated steel pipe.

2.13 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" 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 underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105.

E. 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 "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. 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.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping adjacent to equipment and specialties to allow service and maintenance.

N. Install piping to permit valve servicing.

O. 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.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

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. Pressure-Sealed Joints: Viega Pro Press fittings. Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

H. 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.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. 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 or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

B. 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.

C. 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 NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

D. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water PipingNPS 2 and Smaller: Plastic-to-metal transition fittings.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. 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 and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.
3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
5. NPS 6: 48 inches with 3/4-inch rod.
6. NPS 8: 48 inches with 7/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

L. Install hangers for vertical PEX piping every 48 inches.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
   2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
   4. NPS 6: 48 inches with 3/4-inch rod.
   5. NPS 8: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.9 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. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
   2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   3. 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.
   4. 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 and larger.

3.10 ESCUTCHEON INSTALLATION

A. Refer to Specification section 22 05 00

3.11 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 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, refer to Specification 220500.

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 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 above finished floor level.
      b. 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 above finished floor level. Comply with requirements in Division 07 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.
      b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
      c. 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 Interior Concrete or CMU Block Walls:
      a. Steel pipe sleeves for pipes smaller than NPS 6.
      b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

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 07 Section "Penetration Firestopping" for firestop materials and installations.

3.12 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.

3.13 WALL PENETRATION SYSTEM INSTALLATION

A. Install wall penetration systems in new, exterior concrete walls.

B. Assemble wall penetration system components with sleeve pipe. Install so that end of sleeve pipe and face of housing are flush with wall. Adjust locking devices to secure sleeve pipe in housing.

3.14 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.

3.15 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. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   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 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.

3.16 ADJUSTING

A. Perform the following adjustments before operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
      a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
      b. Adjust calibrated balancing valves to flows indicated.
   5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
   6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
   7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
   8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.17 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 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 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. Clean non-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 procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.18 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 2-1/2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 3 and larger.
   2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
   3. Hot-Water Circulation Piping, Balancing Duty: Calibrated 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 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Strainers.
7. Outlet boxes.
8. Hose stations.
9. Hose bibbs.
10. Wall hydrants.
11. Drain valves.
12. Water hammer arresters.
13. Air vents.
14. Trap-seal primer valves.
15. Trap-seal primer systems.

B. Related Sections include the following:
1. Division 22 Section "Domestic Water Piping".

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 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. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrowhead Brass Products, Inc.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. Legend Valve.
e. MIFAB, Inc.
f. Prier Products, Inc.
g. Watts Industries, Inc.; Water Products Div.
h. Woodford Manufacturing Company.
i. Zurn Plumbing Products Group; Light Commercial Operation.
j. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
1. 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. Flomatic Corporation.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 10 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check Backflow-Prevention Assemblies:
1. 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. Flomatic Corporation.
    e. Watts Industries, Inc.; Water Products Div.
    f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

C. Hose-Connection Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. Watts Industries, Inc.; Water Products Div.
    c. Woodford Manufacturing Company.

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Honeywell Water Controls.
    d. Watts Industries, Inc.; Water Products Div.
    e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.4 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong International, Inc.
    b. Flo Fab Inc.
    c. ITT Industries; Bell & Gossett Div.
    d. NIBCO INC.
    e. TAC Americas.
    f. Taco, Inc.
    g. Watts Industries, Inc.; Water Products Div.

2. Type: Ball valve with two readout ports and memory setting indicator.
3. Body: Brass or bronze,
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller;flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. StrainersNPS 2 and Smaller: 0.020 inch.

b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.6 OUTLET BOXES

A. Icemaker Outlet Boxes:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. IPS Corporation.
c. LSP Products Group, Inc.
d. Oatey.
e. Plastic Oddities; a division of Diverse Corporate Technologies.

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.7 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Backflow Preventer: Integral nonremovable, drainable, hose-connection backflow preventer complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. Prier Products, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Woodford Manufacturing Company.
h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral backflow preventer and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral backflow preventer and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): Two with each wall hydrant.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
1. 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.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.12 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
1. 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.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

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 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 air-gap fitting, fixed air-gap 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. Install pressure gages on inlet and outlet.

D. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

E. Install balancing valves in locations where they can easily be adjusted.

F. 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.

G. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve,.

H. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 06 Section "Rough Carpentry."

I. Install water hammer arresters in water piping according to PDI-WH 201.

J. Install air vents at high points of water piping.

K. 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.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Double-check backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection backflow-preventer assemblies.
8. Double-check, detector-assembly backflow preventers.
9. Water pressure-reducing valves.
10. Calibrated balancing valves.
11. Primary, thermostatic, water mixing valves.
12. Manifold, thermostatic, water-mixing-valve assemblies.
13. Photographic-process, thermostatic, water-mixing-valve assemblies.
14. Primary water tempering valves.
15. Outlet boxes.
16. Hose stations.
17. Supply-type, trap-seal primer valves.
18. Trap-seal primer systems.

B. 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."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer and 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.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 11 19

This page intentionally left blank

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.4 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.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.6 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; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 6 and smaller shall be the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, vent piping NPS 6 and smaller shall be the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Underground, soil, waste, and vent piping NPS 10 and smaller shall be the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
   1. Heavy duty, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
      a. Manufacturers:
         1) ANACO.
         2) Fernco, Inc.
         3) Ideal Div.; Stant Corp.
         4) Mission Rubber Co.
         5) Tyler Pipe; Soil Pipe Div.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
   1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.

B. Solvent Cement and Adhesive Primer:
1. 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).
2. 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).

2.5 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:
   a. Dallas Specialty & Mfg. Co.
   b. Fernco, Inc.
   c. Logan Clay Products Company (The).
   d. Mission Rubber Co.
   e. NDS, Inc.
   f. Plastic Oddities, Inc.
2. Sleeve Materials:
   a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Mission Rubber Co.

C. Rigid, Unshielded, Nonpressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:
   a. ANACO.

D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
1. Manufacturers:
   a. EBAA Iron Sales, Inc.
   b. Romac Industries, Inc.
   c. Star Pipe Products; Star Fittings Div.

E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Manufacturers:
   a. SIGMA Corp.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. 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 drain pipe. 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.

F. 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.

G. 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 and smaller; 1 percent downward in direction of flow for piping NPS 4 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.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

J. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

K. 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 "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
   1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
   2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
   3. Install backwater valves in accessible locations.
   4. Backwater valve are specified in Division 22 Section "Sanitary Waste Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Install individual, straight, horizontal piping runs according to the following:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet 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 for Plumbing Piping and Equipment."

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 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: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2: 84 inches with 3/8-inch rod.
2. NPS 3: 96 inches with 1/2-inch rod.
3. NPS 4: 108 inches with 1/2-inch rod.
4. NPS 6: 10 feet with 5/8-inch rod.

J. Install supports for vertical stainless-steel piping every 10 feet.

K. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

L. Install supports for vertical copper tubing every 10 feet.

M. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. 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. Use flanges instead of unions for connections NPS 2-1/2 and larger.

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. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

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 or, in absence of published procedures, as follows:
   1. 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 separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

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 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 22 13 16

SECTION 22 13 19 - SANITARY WASTE, VENT, AND ROOF DRAIN PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Roof drains
   4. Air-admittance valves.
   5. Roof flashing assemblies.
   6. Through-penetration firestop assemblies.
   7. Miscellaneous sanitary drainage piping specialties.
   8. Flashing materials.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products 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.
i. Josam Company; Josam Div.
j. Kusel Equipment Co.
k. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
l. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Square.

12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

B. Cast-Iron Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products 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.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, drilled-and-threaded cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
10. Top or Strainer Material: Gray iron (mechanical rooms), Nickel bronze (all others).
11. Top Shape: Per drawings..
12. Dimensions of Top or Strainer: Per drawings.

13. Trap Material: Cast iron.
14. Trap Pattern: Standard P-trap.

2.3 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Sioux Chief Manufacturing Company, Inc.
    e. WATTS; A Watts Water Technologies Company.
    f. Wade;
    g. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 14-to 16-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Outlet Type: No hub.
8. Underdeck Clamp: Required.
9. Sump Receiver Plate: Required.
10. Dome Material: Cast iron.
11. Perforated Gravel Guard: Stainless steel.
12. Water Dam: 2 incheshigh.

2.4 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance 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. Ayrlett, LLC.
    b. Durgo, Inc.
    c. Oatey.
    d. ProSet Systems Inc.
    e. RectorSeal.
    f. Studor, Inc.

3. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
4. Housing: Plastic.

5. Operation: Mechanical sealing diaphragm.
6. Size: Same as connected fixture or branch vent piping.

B. Wall Box:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Durgo, Inc.
b. Oatey.
c. RectorSeal.
d. Studor, Inc.

2. Description: White plastic housing with white plastic grille, made for recessed installation. Include bottom pipe connection and space to contain one air-admittance valve.
3. Size: About 9 inches wide by 8 inches high by 4 inches deep.

2.5 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products 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., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches 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.

2.6 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.7 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open (Hub) 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: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-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 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 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.

H. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.8 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., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. 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 backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. 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 or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

H. Assemble and install ASME A112.3.1, stainless-steel channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.

I. Assemble non-ASME A112.3.1, stainless-steel channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

J. Assemble FRP channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

K. Assemble plastic channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

L. Install fixture air-admittance valves on fixture drain piping.

M. Install air-admittance-valve wall boxes recessed in wall.

N. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

O. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

P. Install through-penetration firestop assemblies in plastic stacks at floor penetrations.

Q. Assemble open drain fittings and install with top of hub 2 inches above floor.

R. Install deep-seal traps on floor drains and other waste outlets, if indicated.

S. 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.

T. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

U. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

V. Install vent caps on each vent pipe passing through roof.

W. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

X. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

Y. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

Z. Install wood-blocking reinforcement for wall-mounting-type specialties.

AA. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

BB. 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., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 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 22 13 19

SECTION 22 33 00 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following electric water heaters:
   1. Light Commercial Electric Water Heaters
   2. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: For each type of commercial and instantaneous electric water heater, signed by product manufacturer.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. 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.

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

E. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:
      a. Commercial Electric Water Heaters:
         1) Storage Tank: Five years.
         2) Controls and Other Components: Three years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 for household, storage electric water heaters.

   1. Manufacturers:
      a. Bradford White Corporation.
      b. Lochinvar Corporation.
      c. Rheem Water Heater Div.; Rheem Manufacturing Company.
      d. Ruud Water Heater Div.; Rheem Manufacturing Company.
      e. Smith, A. O. Water Products Company.
      f. State Industries, Inc.

2. Storage-Tank Construction: Steel, vertical arrangement.

    a. Tappings: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

    a. Anode Rod: Replaceable magnesium.
    b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
    c. Drain Valve: ASSE 1005.
    d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
    e. Jacket: Steel with enameled finish.
    f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
    g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
    h. Temperature Control: Adjustable thermostat for each element.
    i. Safety Control: High-temperature-limit cutoff device or system.
    j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction with legs for off-floor installation.

2.3 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.

C. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

D. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that are capable of isolating each water heater and of providing balanced flow through each water heater.

E. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.

F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

2.4 SOURCE QUALITY CONTROL

A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
   1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
   2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install seismic restraints for commercial water heaters. Anchor to substrate.

D. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

G. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

H. Install thermometers on inlet and outlet piping of household, collector-to-tank, solar-electric water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

I. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, thermometer in each water heater inlet and outlet, and throttling valve in each

water heater outlet. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves and to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

J. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.

K. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

L. Fill water heaters with water.

M. Charge compression tanks with air.

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 water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and instantaneous electric water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 22 33 00

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Laminar-flow faucet-spout outlets.
3. Flushometers.
4. Toilet seats.
5. Protective shielding guards.
6. Fixture supports.
7. Water closets.
8. Urinals.
9. Lavatories.
10. Commercial sinks.
11. Kitchen sinks.
12. Service basins.

B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PMMA: Polymethyl methacrylate (acrylic) plastic.

H. PVC: Polyvinyl chloride plastic.

I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Bathtubs: ANSI Z124.1.
3. Plastic Lavatories: ANSI Z124.3.
4. Plastic Laundry Trays: ANSI Z124.6.
5. Plastic Mop-Service Basins: ANSI Z124.6.
6. Plastic Shower Enclosures: ANSI Z124.2.
7. Plastic Sinks: ANSI Z124.6.
8. Plastic Urinal Fixtures: ANSI Z124.9.
9. Plastic Whirlpool Bathtubs: ANSI Z124.1 and ASME A112.19.7M.
10. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
11. Slip-Resistant Bathing Surfaces: ASTM F 462.
12. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
13. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
14. Stainless-Steel Residential Sinks: ASME A112.19.3.
15. Vitreous-China Fixtures: ASME A112.19.2M.
16. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
17. Water-Closet, Flushometer Tank Trim: ASSE 1037.
18. Whirlpool Bathtub Fittings: ASME A112.19.8M.

H. 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.

I. 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. Deck-Mounted Bath/Shower Transfer Valves: ASME 18.7.
4. Faucets: ASME A112.18.1.
5. Hand-Held Showers: ASSE 1014.
6. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Manual-Control Antiscald Faucets: ASTM F 444.
9. Pipe Threads: ASME B1.20.1.
10. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
12. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

J. 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.

K. 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. Floor Drains: ASME A112.6.3.
5. Grab Bars: ASTM F 446.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Hot-Water Dispensers: ASSE 1023 and UL 499.
8. Off-Floor Fixture Supports: ASME A112.6.1M.
9. Pipe Threads: ASME B1.20.1.
10. Plastic Shower Receptors: ANSI Z124.2.
11. Plastic Toilet Seats: ANSI Z124.5.
12. Supply and Drain Protective Shielding Guards: ICC A117.1.
13. Whirlpool Bathtub Equipment: UL 1795.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 3 of each type.
4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
5. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Delta
b. Zurn

c. T&S Brass
d. American Standard

2. Description: Single lever manual type; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

a. Body Material: Commercial, solid brass.
b. Finish: Polished chrome plate.
c. Maximum Flow Rate: 0.5 gpm.
d. Centers: 4 inches.
e. Mounting: Deck, exposed.
f. Actuation: Manual, single lever.
g. Spout: Rigid type.
h. Spout Outlet: Aerator.
i. Drain: Grid.
j. Tempering Device: Thermostatic mixing valve.

2.2 SINK FAUCETS

A. Sink Faucets,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Chicago Faucets.
b. Delta Faucet Company.
c. T & S Brass and Bronze Works, Inc.
d. Zurn

2. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor. Provide with spray where required by the drawings.

a. Body Material: Commercial, solid brass.
b. Finish: Polished chrome plate.
c. Maximum Flow Rate: 1.0 gpm, unless otherwise indicated.
d. Mixing Valve: Single control or Two-lever handle as required by the drawings.
e. Centers: 8 inches.
f. Mounting: Deck,.
g. Handle(s): Lever or Wrist blade as required by the drawings.
h. Spout Type: Rigid, solid brass.
i. Spout Outlet: Aerator.
j. Vacuum Breaker: Not required.
k. Operation: Compression, manual (wrist blades); Noncompression, manual (single lever).
l. Drain: Basket Strainer.

2.3 FLUSHOMETERS

A. Flushometers,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Sloan Valve Company.
b. Zurn

2. Description: Flushometer for urinal and water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

    a. Internal Design: Diaphragm operation.
    b. Style: Exposed.
    c. Inlet Size: NPS 3/4 (urinal); NPS 1 (water closet).
    d. Trip Mechanism: Manual lever.
    e. Consumption: 0.5 gal./flush (urinal); 1.28 gal/flush (water closet).

2.4 TOILET SEATS

A. Toilet Seats,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Bemis Manufacturing Company.
    b. Centoco Manufacturing Corp.
    c. Church Seats.
    d. Olsonite Corp.

2. Description: Toilet seat for water-closet-type fixture.

    a. Material: Molded, solid plastic with antimicrobial agent.
    b. Configuration: Open front without cover.
    c. Size: Elongated.
    d. Hinge Type: SC, self-sustaining, check.
    e. Class: Heavy-duty commercial.
    f. Color: White.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Engineered Brass Co.
    b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
    c. McGuire Manufacturing Co., Inc.
    d. Plumberex Specialty Products Inc.
    e. TCI Products.
    f. TRUEBRO, Inc.
    g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.6 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports,:

1. Description: Combination carrier designed for accessible and standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Supports,:

1. Description: Type II, urinal carrier with hanger and bearing plates for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

D. Lavatory Supports,:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.7 DISPOSERS

A. Disposers,:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. In-Sink-Erator; a div. of Emerson Electric Co.
   b. KitchenAid.

2. Description: Continuous-feed household, food-waste disposer. Include reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.

   a. Type: Continuous-feed household.
   b. Model: Sound-insulated chamber and stainless-steel outer shell.
   c. Motor: 115-V ac, 1725 rpm, 1 hp with overload protection.

2.8 WATER CLOSETS

A. Water Closets,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Crane Plumbing, L.L.C./Fiat Products.
c. Eljer.
d. Kohler Co.
e. Sloan
f. TOTO USA, Inc.
g. Zurn.

2. Description: Accessible, floor-mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation.
a. Style: Flushometer valve.

1) Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
2) Height: Accessible.
3) Design Consumption: 1.28 gal./flush.
4) Color: White.

b. Flushometer: See Drawings

2.9 URINALS

A. Urinals,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Crane Plumbing, L.L.C./Fiat Products.
c. Eljer.
d. Kohler Co.
e. Sloan
f. Zurn (Basis of Design)

2. Description Stall-type, bottom-outlet, vitreous-china fixture designed for flushometer valve operation.

a. Type: Sloped front, with seam cover for 24-inch centers.
b. Strainer or Trapway: Separate removable strainer.
c. Design Consumption: 0.5 gal./flush.
d. Color: White.
e. Supply Spud Size: NPS 3/4.
f. Outlet Size: NPS 2.

2.10 LAVATORIES

A. Lavatories,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sloan (no subsitutions

2. Description: Refer to the schedule on the drawings.

2.11 COMMERCIAL SINKS

A. Commercial Sinks,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkay Manufacturing Co.
   b. Just Manufacturing Company.

2. Description: One or Two-compartment as required by the Drawings, counter-mounting or under-mounted as described on the drawings, stainless-steel commercial sink.

   a. Overall Dimensions: Refer to Drawings
   b. Metal Thickness: Refer to Drawings.
   c. Compartment(s):

      1) Dimensions: Refer to Drawings
      2) Drain: Basket Strainer.

   d. Faucet(s): Sink.

      1) Number Required: One.
      2) Mounting: Deck.

   e. Supplies: NPS 1/2 chrome-plated copper with stops or shutoff valves.
   f. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch-thick tubular brass waste to wall; and wall escutcheon(s).
   g. waste.

2.12 SERVICE BASINS

A. Service Basins,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acorn Engineering Company.
   b. Crane Plumbing, L.L.C./Fiat Products.
   c. Florestone Products Co., Inc.
   d. Precast Terrazzo Enterprises, Inc.
   e. Stern-Williams Co., Inc.

2. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.

a. Shape: Per Drawings.
b. Size: 24 by 24 inches.
c. Height: 12 inches with dropped front.
d. Tiling Flange: On two sides.
e. Rim Guard: On all top surfaces.
f. Drain: Grid with NPS 3 outlet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. 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.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. 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.

M. Install toilet seats on water closets.

N. 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.

O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. 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.

Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.

R. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. 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.

T. Install escutcheons at piping wall 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 "Common Work Results for Plumbing."

U. Set showers and service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

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 07 Section "Joint Sealants."

3.3 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.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 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.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 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 Owner.

END OF SECTION 22 40 00

This page intentionally left blank

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. HVAC demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. 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 HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 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.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. 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 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.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. 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.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 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 minimum working pressure at 180 deg F.
   1. Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Eclipse, Inc.
      d. Epco Sales, Inc.
      e. Hart Industries, International, Inc.
      f. Watts Industries, Inc.; Water Products Div.
      g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
   1. Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Epco Sales, Inc.
      d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   1. Manufacturers:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
   2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
   1. Manufacturers:
      a. Calpico, Inc.
      b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
   1. Manufacturers:
      a. Perfection Corp.
      b. Precision Plumbing Products, Inc.
      c. Sioux Chief Manufacturing Co., Inc.
      d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Manufacturers:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Metraflex Co.
      d. Pipeline Seal and Insulator, Inc.
   2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Stainless steel. Include two for each sealing element.
   4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch 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.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 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 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type with spring clips.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
      h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
      c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
         1) Seal space outside of sleeve fittings with grout.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches 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.

R. 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 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.

S. 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 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. 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 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. 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 Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. 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 HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 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 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 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, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC 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.

3.9 GROUTING

A. Mix and install grout for HVAC 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.

END OF SECTION 23 05 00

This page intentionally left blank

SECTION 23 05 29 - HANGERS AND SUPPORTS 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of Insert material.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.
   c. Flex-Strut Inc.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut Corporation; Tyco International, Ltd.
   g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.
8. Paint Coating: Epoxy.
9. Plastic Coating: Epoxy.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.

8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 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.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal 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 the building structure.

B. Metal 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 for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

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 for use in lightweight concrete or concrete slabs less than 4 inches thick 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. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. 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.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. 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 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.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

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 allowed by 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.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 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 bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 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/D1.1M 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 so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. 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 noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F,pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. 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 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. 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 for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. 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. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. 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.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. 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.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

This page intentionally left blank

SECTION 23 05 53 - IDENTIFICATION 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment (outdoor equipment):

1. Material and Thickness: Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment (indoor equipment):

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch 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.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. 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.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch 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 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, 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 high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

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. 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 40 feet along each run. Reduce intervals to 20 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Chilled-Water Piping:

a. Background Color: Green.
b. Letter Color: White.

2. Heating Water Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

3. Refrigerant Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Chilled Water: 2 inches, round.
   b. Hot Water: 2 inches, round.
   c. Gas: 2 inches, round.

2. Valve-Tag Color:

   a. All Services: Natural.

3. Letter Color:

   a. All Services: Black.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

This page intentionally left blank

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. TAB: Testing, adjusting, and balancing.

C. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. 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. Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. 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.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. TAB Conference: Meet with Commissioning Authority 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 plan.
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. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 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 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage the following:

1. An AABC certified TAB firm.

3.2 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 Division 23 Section "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 terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. 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.

3.3 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.

3.4 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 62.1-2004, Section 7.2.2, "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. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC 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.

3.5 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. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. 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.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.6 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 Division 23 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.

3.7 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. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 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 steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. 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.

3.10 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 5 percent.
2. Air Outlets and Inlets: Plus or minus 5 percent.
3. Heating-Water Flow Rate: Plus or minus 5 percent.
4. Cooling-Water Flow Rate: Plus or minus 5 percent.

3.11 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.

2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

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, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
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, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

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 o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Air flow rate in cfm.
i. Face area in sq. ft..
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Air flow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. 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, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

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, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.

c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Round, Flat-Oval, 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.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.

e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

M. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 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.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents 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 Engineer and Commissioning Authority..
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Engineer and Commissioning Authority.
3. Engineer & Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

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.

3.14 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 23 05 93

This page intentionally left blank

SECTION 23 07 00 - HVAC 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:

1. Insulation Materials:
   a. Flexible Elastomeric
   b. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.

B. Related Sections:
1. Division 22 Section "Plumbing Insulation."
2. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

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. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Sample Sizes:

a. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
b. Sheet Form Insulation Materials: 12 inches square.
c. Jacket Materials for Pipe: 12 inches long by NPS 2.
d. Sheet Jacket Materials: 12 inches square.
e. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

D. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and 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.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. 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: Closed-cell, flexible EPDM based elastomeric insulation. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armacell LLC: Armaflex UT/Solaflex.
      b. Aeroflex: Aerocell AC.

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.; Duct Wrap.
      b. Johns Manville; Microlite.
      c. Knauf Insulation; Duct Wrap.
      d. Manson Insulation Inc.; Alley Wrap.
      e. Owens Corning; All-Service 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. For equipment 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. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, provide one of the following:

a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.

C. 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. 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 and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

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).

C. 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).

D. 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).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

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 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-35.
    b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    c. ITW TACC, Division of Illinois Tool Works; CB-50.
    d. Marathon Industries, Inc.; 590.
    e. Mon-Eco Industries, Inc.; 55-40.
    f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-30.
    b. Foster Products Corporation, H. B. Fuller Company; 30-35.
    c. ITW TACC, Division of Illinois Tool Works; CB-25.
    d. Marathon Industries, Inc.; 501.
    e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; Encacel.
    b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
    c. Marathon Industries, Inc.; 570.
    d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-10.
    b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    d. Marathon Industries, Inc.; 550.
    e. Mon-Eco Industries, Inc.; 55-50.

f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.
e. Vimasco Corporation; 136.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
4. Service Temperature Range: Minus 50 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. Vimasco Corporation; 750.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Vimasco Corporation; Elastafab 894.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; Chil-Glas No. 5.

C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for duct, equipment, and pipe.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

1. Products: Subject to compliance with requirements, provide one of the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    b. Compac Corp.; 104 and 105.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    b. Compac Corp.; 110 and 111.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.

2. Width: 3 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products; Bands.

b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. 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. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel or Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. 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-wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C & F Wire.
    b. Childers Products.
    c. PABCO Metals Corporation.
    d. RPR Products, Inc.

2.13 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, 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, duct system, 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. 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. Apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 MINERAL-FIBER INSULATION INSTALLATION

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 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, tape vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape and mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Duct hangers shall be installed between duct and insulation. Hangers on outside of insulation are not acceptable.
8. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
9. Seal all joints, seams, tears, punctures, etc. with FSK tape and vapor barrier mastic.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 DUCT INSULATION SCHEDULE

A. Refer to the Insulation Schedule shown on the drawings.

END OF SECTION 23 07 00

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-454b:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR, hard drawn only.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8/A5.8M.

2.3 VALVES AND SPECIALTIES

A. Service/Isolation Valves for VRF/VRV Systems:

1. Sherwood WAS Series ball valve with Access Fitting and standard brazed connection (no flared connections allowed)
2. Body: Forged brass with brass seal cap.
3. Ball: Polished brass.
4. Seals: Dual Teflon ball seals.
5. End Connections: Standard brazed.
6. Working Pressure Rating: 700 psig.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service/isolation valves for VRV/VRF systems where specified on the drawings.

B. Install any and all valves, filter driers, etc., as required by the HVAC systems/equipment manufacturers.

3.3 PIPING INSTALLATION

A. 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 Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in accordance with the requirements listed on the plans and in accordance with the systems/equipment manufacturers requirements.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. 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.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping adjacent to machines to allow service and maintenance.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 31 13 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with the following or the system/equipment manufacturer’s written instructions, whichever is more stringent.
2. Comply with ASME B31.5, Chapter VI.
3. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
4. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the system/equipment manufacturer’s written procedures:

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:
1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:
1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.

4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:
1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. 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.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. 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. Round Duct Schedule.
   1. Exposed: Spiral seal construction
   2. Concealed:
      a. 16” dia. and smaller: Spiral seam construction or snap-lock seam.
      b. 18” dia. and larger: Spiral seam

B. Flat Oval Duct Schedule.
   1. All: Spiral seam construction

C. Spiral Seam Duct, Round and Flat Oval.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hamlin, Inc.
      b. Eastern Sheet Metal
      c. Lindab Inc.
      d. McGill AirFlow LLC.
      e. SEMCO Incorporated.
      f. Spiral Manufacturing Co., Inc.
      g. Prior Approved Equal
   2. Joint Type:
      a. 48” dia. and smaller: Gasketed, slip-on type.

b. 49” dia. and larger: Flanged, gasketed.

D. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on the duct schedule above and the indicated static-pressure class.

E. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

F. 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," based on the duct schedule above and for specified static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

G. 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," based on the duct schedule above and for the specified static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

H. 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," based on the duct schedule above and for the 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: G90.
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. 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.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, 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, 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. Solvent-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, 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).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.

5. Use: O.
6. For indoor applications, 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).

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "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, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. 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.

3.3 DUCT SEALING

A. 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. All Ducts and Joints: Seal Class A.

B. Exposed duct that does not have external insulation shall not have duct sealer applied to the joints unless specifically indicated on the drawings.

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 thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "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 of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 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 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:
   1. Visually inspect duct system to ensure that no visible contaminants are present.
   2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
      a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Any uninstalled ducts that fail inspection shall cleaned re-tested.

E. Any installed ducts that fail inspection shall require that the entire installed duct system be cleaned.

F. Prepare test and inspection reports.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate all ducts with galvanized sheet steel.

B. Supply Ducts:
   1. All supply ducts:
      a. Pressure Class: Positive 2-inch wg.
      b. Minimum SMACNA Seal Class: A.

C. Return Ducts:
   1. All return ducts:
      a. Pressure Class: Positive or negative 2-inch wg.
      b. Minimum SMACNA Seal Class: A.

D. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg.
      b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.

E. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel.

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 or Lower:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

b. Velocity 1000 to 1500 fpm:
   1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   2) Radius Type RE 3 with minimum 1.5 radius-to-diameter ratio and two vanes.

c. Velocity 1500 fpm or Higher:
   1) Radius Type RE 3 with minimum 1.5 radius-to-diameter ratio and two vanes.

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) Velocity 1000 fpm or Lower: 1.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      4) Radius-to Diameter Ratio: 1.5.
   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches and Larger in Diameter: 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: 90-degree tap.
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." Saddle taps are permitted in existing duct.
   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Manual volume dampers.
2. Fire dampers.
3. Flange connectors.
4. Duct-mounted access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

B. Related Sections:
1. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 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.

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

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.
   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, 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, 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 minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. Leader, Inc.
e. McGill AirFlow LLC.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Pottorff; a division of PCI Industries, Inc.
i. Ruskin Company.
j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Hat-shaped, galvanized-steel channels, 0.064-inch 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 thick.
6. Blade Axles: Stainless steel.
7. Bearings:
   a. Stainless-steel sleeve.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
9. Quadrant Operators: Locking type with insulation standoff bracket.

2.3 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Air Balance Inc.; a division of Mestek, Inc.
   2. Arrow United Industries; a division of Mestek, Inc.
   3. Cesco Products; a division of Mestek, Inc.
   4. Greenheck Fan Corporation.
   5. Leader, Inc.
   6. McGill AirFlow LLC.
   7. METALAIRE, Inc.
   8. Nailor Industries Inc.
   9. NCA Manufacturing, Inc.
   10. PHL, Inc.
   11. Pottorff; a division of PCI Industries, Inc.
   12. Prefco; Perfect Air Control, Inc.
   13. Ruskin Company.
   14. Vent Products Company, Inc.
   15. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: Refer to Architectural Drawings.

E. Frame: Curtain type with blades outside the airstream; fabricated with roll-formed, 0.034-inch-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 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-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.4 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.
4. TDC Formed on Flanges.

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.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 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. Vision panel.
      d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.
   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
   3. Number of Hinges and Locks:
      a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
      b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
      c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
      d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:
   1. Door and Frame Material: Galvanized sheet steel.
   2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
   3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
   4. Factory set at 6-inch wg.
   5. Doors close when pressures are within set-point range.
   6. Hinge: Continuous piano.
   7. Latches: Cam.
   8. Seal: Neoprene or foam rubber.
   9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.6 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. Ventfabrics, Inc.
   4. 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 5-3/4 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd..
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd..
   2. Minimum Tensile Strength: 500 lbf/inch in the warp and 440 lbf/inch in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F.

G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
   1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
   2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
   7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.7 FLEXIBLE DUCTS

A. Manufacturers:
   1. Flexmaster U.S.A., Inc.
   2. McGill AirFlow LLC.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
   4. Prior Approved Equal

B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 to plus 210 deg F.
   4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

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, to suit duct size.
   2. Non-Clamp Connectors: Adhesive plus tape.

2.8 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 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. Upstream from air flow measuring stations.
   5. 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.
   6. Upstream and downstream from turning vanes.
   7. Control devices requiring inspection.
   8. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:
   1. 18”x18” or as large as the duct will allow if duct is smaller.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to air handling units.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect shut-off terminal units to supply ducts directly on inlet and outlet.

P. Connect fan powered terminal units to upstream (medium pressure) supply ducts with maximum 12-inch lengths of flexible duct. Connect to discharge duct with flex duct connectors. Do not use flexible ducts to change directions.

Q. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

R. Connect flexible ducts to metal ducts with adhesive plus tape plus draw bands.

S. Install duct test holes where required for testing and balancing purposes.

T. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.
   5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Ceiling-mounting ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Roof curbs.
   7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Power, signal, and control wiring.
   2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Roof framing and support members relative to duct penetrations.
   2. Ceiling suspension assembly members.
   3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTING VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Aerovent; a Twin City Fan Company
   2. Carnes Company HVAC.
   3. Greenheck.
   4. Loren Cook Company.
   5. Penn-Barry.

B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Plastic or Aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:
   1. EC Motor with on-board speed adjustment.
   2. Isolation: Rubber-in-shear vibration isolators.

2.2 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Greenheck.
   2. Loren Cook Company.
   3. Penn-Barry.
   4. Twin City Fan.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

   1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
   2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:
1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
4. EC Motor with on-board speed adjustment for direct drive motors.
5. Automatic Belt Tensioner for belt driven fans.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 14 inches above finished roof.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.
   2. Louver face diffusers.
   3. Grilles

B. Related Sections:
   1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Carnes.
b. Krueger.
c. METALAIRE, Inc.
d. Nailor Industries Inc.
e. Price Industries.
f. Titus.
g. Tuttle & Bailey.
2. Material: Steel or Aluminum (refer to the drawings)
3. Finish: Baked enamel, white.
4. Face Size: Refer to drawings
5. Mounting: Refer to Drawings.
6. Pattern: Fixed.

B. Louver Face Diffuser:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Carnes.
b. METALAIRE, Inc.
c. Nailor Industries Inc.
d. Price Industries.
e. Titus.
f. Tuttle & Bailey.
2. Material: Steel or Aluminum (refer to the drawings)
3. Finish: Baked enamel, white.
4. Face Size: Refer to Drawings
5. Mounting: Refer to Drawings.
6. Pattern: Four-way core style.

2.2 GRILLES

A. Fixed Face Grille:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Carnes.
b. Krueger.
c. Metalaire
d. Nailor Industries Inc.
e. Price Industries.
f. Titus.
g. Tuttle & Bailey.
2. Material: Steel or Aluminum (refer to the drawings)
3. Finish: Baked enamel, white.
4. Frame: 1-1/4 inches wide.
5. Mounting: Refer to drawings

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

This page intentionally left blank

SECTION 23 81 26 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: One year(s) from date of Substantial Completion.
c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following
1. Trane
2. Carrier
3. York
4. Daikin

2.2 INDOOR UNITS

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
7. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: Permanent, cleanable.

10. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 2 inches deep.

    b. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 1.

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
    e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

2.3 OUTDOOR UNITS

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant: R-410A.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 0 deg F.
7. Anti-short cycle timer.
8. Crankcase heater.
9. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Crankcase heater

B. Low ambient control to 0 deg. F.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Drain Hose: For condensate.

2.5 CAPACITIES AND CHARACTERISTICS

A. Refer to the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 07 72 00 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
4. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 23 31 13 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 23 33 00 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 26

SECTION 26 05 00— GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. The provisions of all other sections of Division 1 of these Specifications shall govern the work under this Division or Section the same as if incorporated herein.

1.2 SCOPE

A. The Contractor shall provide and install complete electrical systems including all conductors, raceways, fittings, protective devices, wiring devices, fixtures, supports, and all miscellaneous hardware necessary. All of the above equipment shall be completely installed and left in proper operating condition. All electrically powered equipment whether furnished by others or by the Contractor shall be wired by the Contractor.

B. Complete Power distribution and utilization system shall be installed, including panels, utilization devices and equipment as indicated on drawings.

C. The Contractor shall furnish and install power, wiring and/or disconnects as shown on drawings for wiring systems for mechanical systems specified in the Mechanical Divisions of the specifications. Temperature control wiring, equipment control and interlock wiring are not included in this division unless specifically noted in these specifications or shown on the plans. All motor disconnects, starters, combination motor controllers and motor control centers shall be furnished under this division of specifications unless noted otherwise.

1.3 REQUIREMENTS

A. Field verification of scale on electrical plans is directed since actual locations, distances and levels will be governed by actual field conditions.

B. In case of conflicts or discrepancies between plans, plans and specifications and/or actual field conditions, Contractor shall notify the Engineer before work is continued. Coordinate with other trades to avoid conflicts.

C. Permits, and Tests - The Contractor shall procure and pay for all permits, fees and licenses required. Perform all tests to ensure all systems are in good operating condition.

D. Review of Material; Specific reference in the specification to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

E. Bidders shall base bids on the material specified or on equals receiving approval 10 days prior to Bid Opening. Any increase in the cost of work resulting from substitution of any product specified is part of this contract and shall be accomplished in an approved manner at no extra cost to the Owner.

F. Substitutions. No substitution will be considered unless written request for approval has been received by the Engineer at least 10 days prior to the date of receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included; failure to do so does not alleviate the Contractor of his responsibility to make any and all necessary changes required for installation of the approved substitution. The burden of proof of the merit of the proposed substitute is upon the proposer. The Engineer's decision of approval or disapproval of a proposed substitution shall be final.

G. All materials shall be new and of current manufacturer. Where more than one of a type of device is used, all shall be by the same manufacturer. All materials shall conform to the grade, quality and standards of those specified.

H. Shop drawings shall be submitted in accordance with the General Conditions. Forward all shop drawings at one time. Each item shall bear project name and identifying symbol from plans. Shop Drawings required are as follows:
1. Lighting Fixtures
2. Wiring Devices
3. Panelboards
4. Disconnect Switches
5. Lighting Control Panel
6. Fire Alarm System Equipment

I. Interferences - The drawings are generally diagrammatic in nature, and accordingly the Contractor shall coordinate his work with that of all other trades to avoid interferences. The Contractor shall examine the complete set of drawings and specifications for the job before installation of electrical work, coordinating locations and routings with other trades to avoid interferences. Work installed by the Contractor which does interfere with another trade shall be removed and reinstalled at the Contractor's expense when directed by the Architect.

J. Workmanship shall be of the highest quality and all work shall be done by workmen skilled in the trades involved.

K. The Contractor shall guarantee all work under this contract for one year and shall be responsible for the maintenance of all electrical equipment furnished and installed under this contract, excluding lamp replacement, for a period of one year from the date of substantial completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 APPLICABLE CODES AND STANDARDS

Note: The materials and installation shall conform to the minimum requirements and latest outstanding issues and revisions of the following codes, standards, and regulations wherein they apply:

NFPA No. 70, National Electrical Code, (2020 edition)

IBC (2021), IECC (2009), IFC (2021)

American National Standard

National Electrical Safety Code (2021)

Applicable Publications of NEMA, ANSI, IEEE and IPCEA.

Underwriter's Laboratories, Inc. Standards

City, State and Local Codes and Regulations having jurisdiction.

OSHA requirements.

ADA requirements.

END OF SECTION

This page intentionally left blank

SECTION 26 05 01 — BASIC MATERIALS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 SCOPE

A. Contractor Furnished. Unless otherwise noted on the drawings, equipment list, or specifications, the Contractor shall furnish and install all materials, devices, and apparatus necessary for the complete electrical system. All materials and equipment shall be of types and manufacturer specified wherever practical. Should materials or equipment so specified be unobtainable, the Contractor shall submit the description and manufacturer's literature, reason for the substitution request and shall secure the approval of the Engineers before substitution of other material or equipment. This specification establishes performance requirements and the quality of equipment acceptable for use and shall in no way be construed to limit procurement from other manufacturers.

B. Equal or Equivalent. The term "or equal" and similar terms as used on the drawings or specifications shall be interpreted to mean "equal or equivalent" in the opinion of the Engineers.

C. Manufacturer's Prints. Where the Contractor furnishes equipment other than standard construction items, he shall furnish manufacturer's prints and reproducibles of all such equipment to the Engineers.

D. U.L. Listing. All equipment and materials shall be new and conform to the requirements of this specification. All equipment and materials shall be listed by the Underwriter's Laboratories, Inc., and shall bear their label whenever standards have been established and label service is regularly furnished. All equipment and materials shall be of the best grade of their respective kind for the purpose.

PART 2 - PRODUCTS AND EXECUTION

2.1 PANELBOARDS

A. Contractor Furnished. The contractor shall furnish all lighting, service, and power distribution panelboards required. All panelboards shall be of deadfront construction and shall incorporate all switching and protective devices of the type, quantity, number of poles, rating and type specified or shown on the drawings. The drawings and schedules indicate the ampere rating of mains, main breaker or disconnect, main lugs, voltage rating, phases, neutral and type of devices and enclosures. Enclosures for panelboards may be flush or surface type as designated on the drawings.

B. Boxes. Boxes shall be constructed of code gauge galvanized sheet steel and provided with not less than 7" wiring gutters at the sides and 5" at top and bottom. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment (loop feeds), the box shall be sized to include this wiring space. This wiring space shall be in addition to the minimum gutter space specified above and the limiting width may be increased accordingly. Knockout type boxes may be used on flush mounted installations where conduits are routed concealed. Surface mounted boxes shall be furnished without factory stamped knockouts and the contractor shall punch the box for the conduit group desired. Conduit hubs shall be T&B Series 370 "Bullet" hubs or approved equal.

C. Doors. Hinged doors covering all switching device handles shall be included in all panel trims, except that panelboards having individual metal clad externally operable deadfront units may be supplied without such doors. Doors shall have flush or semi-flush type, corrosive resistant, cylinder lock and catch, except that doors over 48" in height shall have a vault handle and 3-point latch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike for all panelboards supplied. Trims shall be fabricated of code gauge sheet steel. Trims for flush panels shall overlap the box by at least 3/4" all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screw-driver without the need for special tools. Trims shall be properly cleaned and finished with a gray paint over a rust inhibiting primer coating. The finish coat shall be the type that will permit adherence of field applied paint.

D. Directory. A directory holder with glass or heavy plastic plate and metal frame shall be mounted inside of each door with a neatly typed directory properly identifying each circuit as shown on panel schedule drawings.

E. Nameplate. The contractor shall furnish and install an engraved, laminated plastic nameplate on the trim. The nameplate shall identify the panel by power source designation, panel designation, voltage rating and phase. Nameplate shall be black engraved letters on white background.

F. Bus Bars. Bus bars and other conductive parts shall be copper and sized in accordance with Underwriter's Laboratories standards, full size insulated neutral bars shall be included. Bussing shall be braced equal to or greater than the highest rated practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

G. Neutral Bus. Neutral bussing on 3-phase panels shall have a suitable lug for each outgoing feeder requiring a neutral connection.

H. Ground Bus. All panels shall be furnished with a bare equipment ground bus. The ground bus shall be of copper and 1/4" x 2" minimum size, properly bonded to the housing. Suitable lugs shall be provided for termination of each equipment ground conductor.

I. Phase Sequence. Bus bar connections to the branch circuit shall be the "distributed phase" or "phase sequence" type. Single-phase, three-wire panelboard bussing shall be such that any two adjacent single-pole units are connected to the opposite polarities in such a manner that two-pole units can be installed at any location. Three-phase, four wire bussing shall be such that any three adjacent single-pole units are individually connected to each of the three different phases in such a manner that two or three-pole units can be installed in any location.

J. Circuit Numbering. Panelboard circuit numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.

K. Terminals. Terminals for feeder conductors to the panelboard mains and neutral shall be U.L. listed as suitable for type of conductor specified and shall be T&B 54000 Series where possible. Terminals for branch circuit wiring, both breaker and neutral, shall be U.L. listed as suitable for the type of conductor specified.

L. 120/208V Panels. All lighting/service panels rated 120/208 volt, shall be equal to Square D Company, Type NQOD equipped with bolt-on branch breakers of the type and rating specified on the drawings.

M. Circuit Breaker Type Distribution Panels. Circuit breaker type distribution panels for the various voltages shall be similar to Square D I-Line type, equipped with I-Line breakers of the type and rating specified in paragraph titled Circuit Breakers, and on the drawings. Panels shall be approved for use as service entrance equipment.

N. Panels and Panelboards are designed around Square D equipment. Acceptable alternate manufacturers are Cutler-Hammer, Siemens, and General Electric Company. All alternate or substitution requests shall meet all performance requirements of specified equipment, as well as space and dimension requirements noted on drawings.

2.2 CIRCUIT BREAKERS

A. Contractor Furnished. The contractor will provide breakers unless specifically designated to be "Owner Furnished" on the drawings, equipment list, or within the specifications.

B. As Specified. Breakers shall be of the type, rating, number of poles, size, and interrupting capacity, specified or required for the environment, location, application, and load served.

C. Molded Case Circuit Breakers. Molded case circuit breakers shall be circuit interrupting devices which will operate both manually for normal switching functions and automatically under overload and short circuit conditions. Circuit breakers shall provide circuit protection when applied within rating.

D. Operating and Switching Mechanism. The operating mechanism shall be entirely trip-free so that the contacts cannot be held closed against an abnormal over-current or short circuit condition. The switching mechanism shall be quick-make, quick-break type.

E. Overload and Short Circuit Protection. The operating handle of the circuit breaker shall open and close all poles of a multi-pole breaker simultaneously. The breakers shall meet applicable NEMA and U.L. specifications. Each circuit breaker shall have a trip unit to provide overload and short circuit protection. The trip unit for each pole shall have elements providing inverse time delay under overload conditions and instantaneous magnetic tripping for short circuit protection. The trip element shall operate a common trip bar which shall operate all poles in case of an overload or short circuit through any one pole. Automatic tripping shall be clearly indicated by handle position.

F. Rating. The molded case circuit breakers shall be rated for fault duty as specified on the plans. Series ratings are not allowed. The Contractor shall verify available fault current with the Utility Company for the actual installation and forward to the Engineer.

2.3 SAFETY SWITCHES

A. Contractor Furnished. The contractor shall provide all safety disconnect switches required. The switches shall be of the type, voltage, ampere, and horsepower rating, number of poles, fusible or nonfusible, as specified or required for the environment, location, application, and load served.

B. Description. All safety switches shall be NEMA premium heavy duty, horsepower rated, industrial type, and shall be Underwriters' Laboratories listed. Fusible switches shall be complete with fuses of the type and rating specified (refer to paragraph "Fuses") and as indicated on the drawings or within these specifications. All switches shall have switch blades that are fully visible in the OFF position when the door is open and shall be of dead front construction with arc suppressors. The mechanism shall be quick-make, quick-break type. The door shall be interlocked (defeatable type) with the handle or mechanism to prevent unauthorized opening of the door in ON position. Pad-locking provisions shall be provided for padlocking in the OFF position with one or more locks or lockable hasps. Grounded switches in a common enclosure shall be mounted in enclosure types specified elsewhere. Individually mounted switches shall be mounted in enclosures suitable for the location and environment as specified on the drawings.

C. Nameplate. All switches shall be provided with an engraved laminated phenolic nameplate showing the power source (Unit No. or other), and title of equipment served. Nameplates to be black letters on white background.

D. Manufacturer and Enclosures. All switches furnished shall have enclosures as specified on the drawings. Acceptable manufacturers shall be Square D, General Electric, Siemens, and Cutler-Hammer.

2.4 FUSES

A. Contractor Furnished. The contractor shall furnish and install fuses in all fusible devices and equipment that are furnished by the contractor.

B. Manufacturer and Listing. The following fuse types shall be used for the applications listed. The following are trade names of the Bussman Manufacturing Division, however, equivalent products by Chase Shawmut Division shall be acceptable.

Application	Trade Names	Class	Voltage (Type)
Motors, Transformers & Miscellaneous Equipment 0-600 Amps	Fusetron	K-5 K-5	240 (FRN) 600 (FRS)
Panelboard Feeders & Service Disconnects 0-600 Amps	Low Peak Low Peak	RK-5 RK-5	240 (LPN-R) 600 (LPS-R)
Panelboard Feeders & Service Disconnects 601-6000 A	HI-CAP	L	600 (KRP-C)

2.5 MISCELLANEOUS CONTROL DEVICES

A. Furnished by Others. Miscellaneous control devices such as duct switches, air flow switches, thermostats and temperature control devices, and similar equipment shall normally be furnished under another division. Any such device that is to be furnished under this division shall be specifically designated on the drawings.

B. Enclosures. All devices furnished shall be suitable for the control requirements and shall have voltage rating and adequate capacity for the application. They shall be housed in enclosures suitable for the location and environment as indicated on the drawings.

2.6 RECEPTACLES – OUTLETS

A. Contractor Furnished. The contractor shall furnish and install all convenience (and power type) receptacles and outlets shown on the drawings. Suitable boxes, covers and matching plugs as specified shall be provided and the installation shall conform to typical details, drawings, and as described elsewhere in this specification. See electrical symbol drawings for additional descriptive data. Contractor shall install ivory devices where called for on plans except in paneled rooms or areas with cabinetry or millwork where brown devices and plates shall be installed.

B. Single Manufacturer. Receptacles of similar usage and rating shall be those of a single manufacturer.

C. Usage and Manufacturer. General use and convenience outlets shall be as specified by symbol on the drawings and as listed on the symbols drawing.

D. Ground Fault Protection. Note that all convenience receptacles to be installed as ground fault interrupting type are so noted on drawings.

E. Isolated Ground Receptacles. Where noted on plans, isolated ground receptacles shall be installed with an insulated, green, #12, copper ground wire unbroken back to breaker panel. Where several isolated ground receptacles are shown on one circuit, they may share the dedicated ground back to the breaker panel.

2.7 BOXES

A. Contractor Furnished. The contractor shall furnish and install all electrical boxes required for the proper installation of the electrical systems. Boxes shall be of the NEMA type suitable for the location. Boxes shall be installed as specified on the drawings and as described under "Wiring Methods", and other applicable sections of this specification for wiring devices such as switches, receptacles, and similar devices. In order to maintain fire ratings, boxes installed "back-to-back" in fire walls shall not be located in the same space between studs, but shall have a stud located between them.

B. Concealed. Fixture, outlet, and switch boxes installed concealed in walls or ceiling areas shall be galvanized or cadmium plated sheet steel of not less than the minimum size as recommended in the National Electrical Code and shall be furnished with appropriate covers as specified in other applicable sections of these specifications or on the drawings. All boxes shall be accessible for maintenance purposes.

C. Exact locations of all floor boxes shall be coordinated in the field with the architect unless specific dimensions are shown on the drawings. Also, see Section 16500 of these specifications.

D. Surface Mounted. Fixture, outlet, and switch boxes installed surface mounted in plant, shop, operating, and unfinished areas shall be threaded, cast alloy iron or malleable iron. Iron type shall have a cadmium/zinc electroplate, or galvanized finish with appropriate lacquer. Boxes shall be of the approved type for the outlets, switches, and fixtures served and shall be made of the material and finish compatible with the conduit system and location. Surface mounted boxes shall be only as noted on the plans.

E. Splice and Tap Boxes. Splice and tap boxes for power circuits shall be used only where designated on the drawings and shall be of the type and size indicated. Otherwise, all power wiring shall be continuous, splice and tap free, between equipment. On lighting and convenience receptacle circuitry, wiring may be spliced and boxes shall be provided for concealed or surface mounting as previously specified or may be JIC oil-tight of size and type indicated on the drawings or minimum size as specified in the National Electrical Code.

F. Pull Boxes. Pull boxes for interior, or outdoor exposed power wiring shall be provided where shown or required to facilitate the installation of the wiring. Pull boxes shall not be located in finished rooms and shall be accessible for maintenance use. For conduit sizes 3/4 and 1 inch, conduit fittings of the "C", "LB", "TB" and similar types may be used for "Pulling In." Unless designated otherwise, all pull boxes shall be the straight-through type and changes in direction shall not be made in the box. The boxes shall be of the minimum size and type as required by the National Electric Code or as sized on the drawings.

G. Exterior and Underground. For exterior exposed work, pull boxes shall be of NEMA 3R construction and shall be threaded hub type with gasketed cover.

2.8 COVERS AND DEVICE PLATES

A. Contractor Furnished. The contractor shall furnish and install the appropriate cover on all boxes, conduit fittings, panels, cabinets, switches, receptacles, and similar wiring devices and other equipment that is Contractor furnished. Conduit outlet fitting covers shall be the type specified under "Conduit Fittings."

2.9 ENCLOSURES

A. Enclosures and housings for all Contractor furnished electrical equipment and devices shall be suitable for the location and environmental conditions and shall be of NEMA type as shown on symbol sheet drawing.

END OF SECTION

SECTION 26 05 19 — CONDUCTORS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this Section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 SCOPE

A. This specification covers the requirements for all wire and cable to be used in the installation of the electrical systems for the project, including all power, lighting, control and instrumentation systems.

B. Wire and cable will normally be furnished by the Contractor for installation. Drawings will indicate where cable is not to be furnished.

C. All cable is to be "Contractor-furnished", the Contractor shall submit for approval by the Owner any deviations anticipated or proposed with respect to the cable manufacturer, cable type, or specification contained herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All wire and cable shall be Underwriters' Laboratories (UL) listed. In addition to other standard labeling, all wire and cable shall be marked UL on the outer surface indicating Underwriters' Laboratories, Inc. certification.

B. Grounding conductors, where insulated, shall be colored solid green. Conductors intended as a neutral shall be colored solid white.

C. For all circuits 600 volt and less, wires and cables shall have code grade, 600-volt type THWN-THHN, 75 degrees C., wet or dry locations, moisture and heat resistant thermoplastic insulation. Insulation thickness shall be per National Electrical Code, Table 310-13.

D. Conductor sizes are expressed in American Wire Gage (AWG) or in circular mils. Conductors shall be annealed copper wire, minimum size #12 AWG, except that #14 AWG may be used for control. All conductors shall be stranded except that solid conductors may be used for #12 AWG lighting and receptacle branch circuits.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separation of Usage. Lighting and power wiring shall be routed in conduits, or other raceways as shown on the drawings. Lighting and power wiring shall not be routed in a common raceway except where shown on drawings. Push-button wiring shall be routed in separate raceways even though related to a particular motor circuit.

B. Pulling. Where mechanical assistance is used for pulling conductors, patented wire pulling compounds having inert qualities that do not harm the wire insulation or covering shall be applied to the conductors as they are pulled into raceways. Interior of all raceways shall be free from grease, filings or foreign matter before conductors are pulled in.

3.2 IDENTIFICATION

A. Wire, Cable, Raceways, and Conduits.

B. Circuit identification numbers shall be placed on each end of the conductor involved by using self-laminating marker tags, T&B Company E-Z Code Type WSL or equal. Circuit numbers shall be as shown on the plan and panel schedule drawings.

C. Phase Identification. Phase sequence throughout the installation shall be standardized wherever practical in all electrical power equipment as follows:

		Phase A	Phase B	Phase C
Position Occupied		Front	Center	Rear
		Top	Center	Bottom
		Left	Center	Right
Color Code:	208/120V, 3-phase	Black	Red	Blue
	480/277V, 3-phase	Brown	Orange	Yellow

3.3 SPLICES AND TERMINATIONS

A. Lighting Conductors. Splices in lighting conductors shall be made with splicing caps with metal inserts only, such as 3M Company's "Scotchlock" spring connectors. The splices shall be firmly and neatly taped to prevent entry of moisture.

B. Power Conductors shall be continuous from outlet to outlet. No power cable shall be spliced except on explicit instructions of the Owner’s Representative.

3.4 LUGS

A. All lugs shall be furnished and installed by the Contractor where required.

B. Lugs for copper power wiring, Sizes No. 12 and No. 10 AWG, shall be T&B "Sta-Kon" uninsulated ring type lugs. Lugs for copper power wiring from No. 10 AWG to size 1/0 AWG shall be T&B 1-hole Type 54100 Series. Size 2/0 AWG and larger lugs shall be 2-hole type

54200 series (except where 1-hole is required to match motor lead lugs). Sizes above 1/0 are to be applied using hydraulic pump tool.

C. Where motor leads are furnished without lugs, T&B 54500 Series 2-way connectors (splicing sleeves) shall be used. Splice sleeves may be desirable where limited space for termination exists.

D. The proper lugs will normally be furnished with equipment in all Owner-furnished equipment. All other lugs shall be furnished and installed by the Contractor. No mechanical type lugs shall be used except in panelboards. If any mechanical type lugs are furnished with Owner-furnished equipment, the Contractor shall replace them with proper compression type lugs where practical.

3.5 TAPING

A. All voids, sharp corners and bolt projections shall be made smooth by filling with Okonite or Scotch Fill before applying the laps of tape required for insulation. All loose strands of wire shall be removed before taping. Duxseal will not be permitted.

B. Joints and other sections of wiring requiring tape shall be half lap and at least two layers. Taping shall be neatly done and shall form a permanent insulation equal in mechanical and electrical strength to the insulation of the conductor. Taping shall be as follows:

1. 600 Volt insulation - A minimum of 1-1/2 lap layer varnished cambric and 2-1/2 lap layers of 3M No. 33 vinyl plastic electrical tape.

C. All taping, splicing and termination materials shall be furnished by the Contractor.

END OF SECTION

This page intentionally left blank

SECTION 26 05 26 — GROUNDING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this Section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 WORK INCLUDES

A. As Required By the NEC. In general, fixtures, outlets, the enclosing cases, mounting frames, etc., of all switches, circuit breakers, control panels, motors and any other electrically operated or electrical equipment, conduit, trays, and other raceways shall be effectively and permanently grounded with a separate copper grounding conductor of cross-section as required by the National Electrical Code and drawings. It shall be of capacity sufficient to ensure continuity and continued effectiveness of the ground connections to carry fault currents. Ground conductors must be as short and straight as possible, protected from mechanical injury and if practicable without splice or joint. The grounding conductor shall be run from a ground established at the source of supply to the equipment to be grounded. Ground wires from below grade shall be protected by galvanized conduit and the conductor shall be brazed to conduit sleeve on each end. All grounding conductors shall be copper.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Power Conductors Supplying Equipment. A copper grounding conductor must be run inside the conduit or raceway, enclosing the power conductors supplying the equipment, or in case of a multi-conductor power cable, must be located within the sheath.

B. Connect at Source. Ground conductors in power cable or ground wire in conduits shall always be connected directly to station ground at the source end, and to motor frame or equipment enclosure and/or equipment ground bar.

C. System Neutral. The equipment grounding conductor in all circuits shall be connected to the frame and ground lug in the panelboards and not the neutral bus. Equipment ground connections to a system neutral are not permitted.

D. Fuses. In all cases of grounded circuits, fuses must be omitted from the grounded neutral conductor throughout the entire installation.

E. Equipment Frames. Frames of all electrical apparatus will be connected to the grounding system. Neutrals of service transformers shall be connected to the grounding system.

F. Metallic Raceways. All metallic conduits and wiring channels must be connected at each end to the grounding conductor with a good electrical contact.

G. Identification. The grounding conductor shall be stranded and covered with a green jacket.

H. In all cases the white wire should be used for the current-carrying neutral only and never as a grounding conductor, or other purpose.

I. Ground Rods. Where specified on drawings, grounding connections to earth shall be made with 5/8" diameter (minimum) copper-clad steel exten-type ground rods a minimum of 8 feet long, or depth as indicated.

END OF SECTION

SECTION 26 05 39 — ELECTRICAL RACEWAYS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this Section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 SCOPE

A. Contractor Furnished. The contractor shall provide all conduit, fittings, and supports required and not otherwise shown on plans as furnished by others.

B. The types of electrical raceways required for the project include the following:

1. Electrical Metallic Tubing
2. Intermediate Metal Conduit
3. Flexible Metal Conduit
4. Liquid-Tight Flexible Metal Conduit
5. Rigid Galvanized Conduit
6. PVC Rigid Conduit

C. The minimum raceway size shall be 3/4".

D. Product Delivery, Storage, and Handling. Contractor is to provide color-coded end-cap thread protectors and handle conduit and tubing carefully to prevent damage. Store pipe and tubing inside whenever possible. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Electrical Metallic Tubing. Galvanized, thin wall tubing, fittings shall be hex-nut, expansion gland type, zinc plated, and U.L. listed as "raintight." No crimp, spring, or set-screw type fittings will be accepted.

B. Intermediate Metal Conduit. Galvanized steel tubing, with zinc coated interior.

C. Flexible Metal Conduit. Galvanized single steel strip, flexible, interlocked.

D. Liquid-Tight Flexible Metal Conduit. Galvanized single steel strip, flexible, interlocked, double wrapped, with liquid-tight PVC jacket.

E. Rigid Galvanized Conduit. Rigid steel, hot-dipped galvanized conduit.

F. PVC Rigid Conduit: U.L. listed Schedule 40 heavy wall rigid conduit.

G. Conduit, tubing and duct accessories including straps, hangers, expansion and deflection fittings as recommended by conduit, tubing, and duct manufacturers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Electrical Metallic Tubing. Branch circuits run in hollow dry walls and above ceilings. Not to be exposed.

B. Flexible Metal Conduit. Connection of motors and for other electrical equipment where subject to movement and vibration and located in a dry, interior location. Flexible conduit is not to exceed 60" in length for any one application.

C. Liquid-tight Flexible Metal Conduit. Connection of motors and for other electrical equipment where subject to movement and vibration, and also subjected to one or more of the following conditions: Exterior location; moist or humid atmosphere where condensate can be expected to accumulate; corrosive atmosphere; subjected to water spray; subjected to dripping oil, grease or water. Flexible conduit is not to exceed 60" in length for any one application.

D. Intermediate Metal Conduit. All conduits of 2" nominal trade size or more and/or where exposed. Not to be stubbed up at floor level.

E. Rigid Galvanized. Where specified on plans for certain underground or exposed runs, or where stubbed up at floor level.

F. Rigid PVC. Where specified on plans for certain underground runs, UL approved Schedule 40 heavy wall rigid PVC conduit shall be used. Not to be stubbed up at floor level. All PVC underground runs shall transition to rigid galvanized before stubbing up through floor slab or grade.

3.2 INSTALLATION

A. Install conduit and tubing in accordance with NEC and National Electrical Contractors Association's "Standard of Installation", and with recognized industry practices. Where NECA and NEC standards differ, use the more stringent requirement.

B. Complete the installation of raceways before starting installation of wires.

C. Wherever possible, install horizontal raceway runs above water and steam piping.

D. Care shall be taken to keep the interior of conduits clean, and each conduit run shall be thoroughly cleaned and dried before any cable is pulled through.

E. Unless indicated otherwise on drawings, all exposed conduits shall be run parallel with or perpendicular to building structural members.

F. Conduits entering sheet metal enclosures shall be made up with double locknut and insulating bushing. Locknut shall be of the type which will bite into the metal of the box.

G. Conduits entering threaded openings in equipment enclosures, boxes, etc., shall have at least five full threads engaged. In outdoor and underground locations, threaded joints shall be made up with a thin application of conducting joint compound. The inside of the fitting shall be thoroughly cleaned of any excess compound.

H. Power operated bending machines shall be used on conduits 1-1/4" and larger. Heating with torches will not be permitted.

I. All conduit runs shall be continuous from outlet to outlet with all joints and connections pulled tight to insure an electrically continuous and mechanically secure raceway system.

J. All raceways in "finished areas" such as offices, corridors, etc., shall be concealed.

3.3 CONDUIT AND TRAY OPENINGS

A. Contractor's Responsibility. The Contractor shall be responsible for all sleeves and openings through walls and floors necessary for passage of electrical conduits and raceways. Where contractor must provide openings and/or drill concrete floors and/or walls, he shall be responsible for the repair of these openings. Structural members and reinforcing shall not be cut, burned or damaged in any way. All openings in walls and floors, and under switchgear and panels where electrical cables and conduits are installed, shall be closed up by the Contractor to prevent dust, dirt and water from entering.

B. Sealing. The Contractor shall be responsible for sealing all wall and floor openings and all floor and wall sleeve openings utilized by the contractor whether furnished by Others or by the Contractor.

C. Sleeves and openings shall be sealed with materials that will withstand fire and heat to the same rating as the wall, floor, or ceiling through which the conduit or tray passes and shall not be less than a 30-minute barrier.

END OF SECTION

This page intentionally left blank

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Division 16 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group III.
3. Seismic Design Category as defined in the IBC: C

a. Component Importance Factor: 1.5 (for life safety related items); 1.0 (for all other items).
b. Component Response Modification Factor: Lighting Fixtures = 1.25; Equipment = 2.5; Distributed System = 3.5.
c. Component Amplification Factor: 1.0.

4. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.309
5. Design Spectral Response Acceleration at 1.0-Second Period: 0.150

1.5 SUBMITTALS

A. 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.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

    a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 16 Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

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 products by one of the following manufacturers:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.

8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

D. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a non-slip 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 Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
   Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

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 products by one of the following:

1. Amber/Booth Company, Inc.

2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

D. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

F. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

G. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.

H. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

I. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

J. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

K. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

L. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-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 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment 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.

END OF SECTION

SECTION 26 05 73.13 - SHORT-CIRCUIT STUDIES

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 a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
    b. Revised single-line diagram, reflecting results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Software Developer, Short-Circuit Study Specialist, and Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. ESA Inc.
3. Operation Technology, Inc.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.

d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

F. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Control panels.
7. Standby generators and automatic transfer switches.
8. Branch circuit panelboards.
9. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION

This page intentionally left blank

SECTION 26 05 73.16 - COORDINATION STUDIES

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 computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Software Developer, Coordination Study Specialist, and Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. ESA Inc.
3. Operation Technology, Inc.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    f. Cables and conductors damage curves.
    g. Ground-fault protective devices.
    h. Motor-starting characteristics and motor damage points.
    i. Generator short-circuit decrement curve and generator damage point.
    j. The largest feeder circuit breaker in each motor-control center and panelboard.
5. Provide adequate time margins between device characteristics such that selective operation is achieved.
6. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

F. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

G. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

H. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures

that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

I. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

J. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

K. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.
2. Switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.

L. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:

1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.

c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION

SECTION 26 05 73.19 - ARC-FLASH HAZARD ANALYSIS

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Software Developer, Arc-Flash Study Specialist, and Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. ESA Inc.
3. Operation Technology, Inc.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

F. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

G. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.

8. Recommendations for arc-flash energy reduction.

H. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:
1. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.

9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Motor-control center.
2. Low-voltage switchboard.
3. Switchgear.
4. Medium-voltage switch.
5. Control panel.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION

SECTION 26 05 75 — ELECTRICAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Materials specified in this Section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 SCOPE

A. INSULATION TEST OF EQUIPMENT AND CABLE

1. The Contractor shall perform DC insulation tests of the type specified on electrical equipment, apparatus and cables under any one or more of the conditions described as follows: (1) At the time equipment such as transformers, switchboards, disconnect switches, cable and similar equipment is delivered or turned over to the Contractor for care, storage, and/or installation; (2) Prior to energization and/or placing into service and acceptance by the Owner; (3) When damage to the insulation is suspected or known to exist; (4) After repairs or modifications to the equipment affecting the insulation; (5) Routinely as necessary to determine or evaluate the condition of the insulation, especially moisture conditions, to determine the need for drying, cleaning or other maintenance work or protection; (6) Where lightning or other surge conditions are known to have existed on the circuit; (7) When equipment is existing to be reused.
2. Insulation tests are required of the Contractor at various stages of construction. The equipment, cable and systems that require testing, the maximum test voltages, and the type test required are specified in this section.

B. GROUNDING SYSTEM TESTING

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSULATION TEST OF EQUIPMENT AND CABLE

A. Two types of insulation tests are referred to or required by this specification. They are briefly described below. At the conclusion of all DC tests, grounds shall be applied to the cable or equipment windings for at least twice as long as the duration of the applied voltage. This is needed to discharge the capacitive voltage built up during the test.

B. The proof test involves the application of a DC voltage in excess of the equipment rating. The test voltage is held constant for a specified time, one minute unless specified otherwise, and the behavior of the insulation current, voltage, and resistance are observed for changes that may indicate approaching failure or poor insulation condition. The magnitude of the insulation

resistance is also considered in the evaluation of the insulation. This test may be conducted with a constant voltage megger or variable source as appropriate.

C. The megger or insulation resistance test is a simple, short test where DC voltage of between 100-1500 volts is applied to a cable or winding from a constant source of potential such as James G. Biddle Company megger insulation tester. The voltage is usually considerably below the maximum test value permitted. The insulation resistance is read off the indicator and is in megaohms. The quality of the insulation is evaluated based on the level of insulation resistance. This test is usually the routine test conducted by the Contractor or may be a preliminary test to a more important proof test to be conducted. Appropriate test voltages shall be confirmed to the Contractor by the equipment manufacturer. All current carrying phase conductors and neutrals shall be tested as they are installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:

1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductor and the grounding conductor.
2. After all fixtures, devices and equipment are installed and all connections completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the panel grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each branch circuit neutral wire separately to the panel grounded enclosure and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the panel grounded enclosure can be achieved with only the neutral feeder disconnected.
3. At final inspection, the contractor shall furnish a meggar and show the engineers that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.

D. Maximum DC Overpotential Test Voltages for Alternating Current Electrical Equipment and Cables. Circuit breakers, switchboard bus, cables, insulators, disconnects, switches and similar equipment types should be tested at not more than three (3) times the RMS rated voltage. These test values are considered to be realistic in most cases for testing this type of equipment. Test voltage levels shall be confirmed by the manufacturer.

E. Test Method and Test Equipment. The megger test and proof test shall be performed on all cables using a Biddle Megger or equivalent testing instrument. The proof test shall be used on all other electrical equipment as mentioned above.

3.2 GROUNDING SYSTEM TESTING

A. Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods. (The compliance should be demonstrated by retesting.)

3.3 DOCUMENTATION

A. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.

B. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION

This page intentionally left blank

SECTION 26 26 00 — SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 WORK INCLUDES

A. Electrical contractor shall coordinate as required with the utility company, and general contractor(s) for site electrical services to provide electrical service to the building by way of padmount transformer, 120/208V, 3 phase service.

B. Electrical contractor shall include in his bid all costs, fees, or charges associated with installation of service to the building by the utility company.

C. Electrical contractor shall confirm exact location of all service and distribution equipment with owner's representative prior to installation.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Padmount transformers shall be provided by utility company.

PART 3 - EXECUTION

3.1 The required coordination and service installation work shall include, but not be limited to the following:

A. Electrical contractor shall be responsible for installing concrete pad for transformer per the utility company's installation requirements and shall install all secondary conduits as shown on drawings, stubbing up in secondary section of transformer wiring area and running underground into the electrical room stubbing up into service equipment.

B. Electrical contractor shall provide coordination with the utility company for primary cable entry into padmount. Two 4" conduits shall be stubbed up into primary space and extend 18" past edge of pad in direction requested by the utility company.

C. Electrical contractor shall install required conduit for signal wires to meter. Meter base shall be provided and mounted on building by contractor as shown on plans and as coordinated with the Utility.

D. Electrical contractor shall install all secondary cables, pulling sufficient lengths for terminations at transformer and at service entrance gear. Service entry conduit shall be PVC, size as noted

on plans, and buried a minimum of 30" below finished grade with yellow warning tape placed 6" above conduits in earth. Electrical contractor shall coordinate all routings with that of other disciplines.

END OF SECTION

SECTION 26 51 00 — LIGHTING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Materials specified in this Section shall comply with all applicable requirements of SECTION 26 05 00, GENERAL PROVISIONS.

1.2 WORK INCLUDED

A. Contractor Furnished. The Contractor shall furnish, install and wire all lighting fixtures and the complete lighting system as shown on the drawings. The contractor shall furnish all appropriate mounting hardware as required for installation of the fixtures in the various ceiling types. The contractor shall coordinate the various ceiling types with the architect's reflected ceiling plan and construction details. All fixtures shall be the type and manufacturer specified, with UL label. Recessed incandescent downlights shall have thermal protection.

B. Typical Details, Drawings and Symbols. The Contractor shall install lighting fixtures as shown on drawings. Refer to symbol drawings for additional descriptive and installation data. The Contractor shall check the location of all fixtures in relation to the structure and the work of other crafts and shall obtain approval of the Owner's representative to relocate fixtures, if required, to avoid interferences.

PART 2 - PRODUCTS

2.1 WIRING DEVICES

A. Wiring Devices. All wall switches for lighting shall be those of a single manufacturer and shall be as specified by the symbol on the drawings and as listed on the symbols drawings.

2.2 LIGHTING FIXTURES

A. All lighting fixtures shall be as specified on the fixture schedule on the drawings.

B. All outdoor fixtures shall be UL listed for wet locations unless mounted recessed in building overhangs, in such cases fixtures which are UL listed for damp locations may be permitted if specifically noted on the drawings.

C. Substitutions: The following manufacturers shall be considered pre-approved for the types of fixtures specified on the drawings when proper fixture grade is submitted. If proper grade fixture is not submitted during the shop drawing phase and submittal is rejected, fixtures must be furnished as specified on the drawings.

Recessed Down Lighting
Omega
Halo
Lithonia
Prescolite
H.E. Williams
Emergency and Exit Lighting
Lithonia
Emergilite
Sure Lites
Dualite

PART 3 - EXECUTION

3.1 FIXTURES

A. Fixtures shall be installed in the locations shown on the drawings. The Contractor shall study the general building plans in relation to the spaces surrounding each fixture in order that his work may fit the other work required, as well as the work of other trades. When necessary, the Contractor shall relocate fixtures so that they will be symmetrically located according to room layout and will not interfere with other work or equipment.

3.2 LIGHTING SWITCHES

A. Lighting Switches. The Contractor shall furnish and install all lighting switches shown on the drawings. The switches shall be installed in the ungrounded lines and shall be mounted in the appropriate boxes for flush or surface mounting as specified under "Boxes". The appropriate coverplates as specified under "covers" shall be installed. Switch mounting shall be as described on the symbol drawings and as described elsewhere in this specification.

B. Local Switches. Local switches shall be located on the strike side of the doors, keeping approximately 3" away from the door trim or corner, wherever possible. Switch handles shall be set to operate vertically; wall receptacles shall be set with the long dimension vertical where possible. Switches suitable for use in mullions of glass partitions shall be used where noted on plans.

C. Neutral Conductor. The neutral conductor of lighting systems shall be of the same size as the phase conductors. On three and four wire systems the load shall be divided as evenly as possible on each "outside" or phase conductor. Neutral conductors shall be identified throughout by using a white or gray (as specified in "Color Code" section) insulated wire. A green ground wire shall be run in raceway to ground all lighting fixtures, receptacles, boxes and wiring devices.

3.3 FINAL INSPECTIONS

A. At the conclusion of the job, the Contractor shall see to it that all fixtures are cleaned and in good operating condition. Upon final inspection all covers shall be installed.

END OF SECTION

SECTION 27 05 00 — TELECOMMUNICATIONS RACEWAY SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general requirements of the Contract, including all Division 1 specification sections, apply to work specified in this section.

1.2 WORK INCLUDES

A. Description of Work: This section includes furnishing all labor, materials and equipment for the installation of the telecommunications raceway system for this project.

B. Contractor shall provide an empty raceway system including outlet boxes for the installation of telephones and data. Conduit shall be provided from outlet box locations to wire basket cable trays, as noted on plans. Conduits terminating at cable trays and telephone/data boards shall have bushings to protect exiting cables. Conduits shall be run concealed where possible above ceilings, in attic, or inside walls, and where not possible, surface raceway shall be utilized.

C. Owner's telephone/data system installer shall install all cable, connection boards, outlet devices and connections to existing system.

D. Electrical Contractor shall coordinate with Owner and installer for scheduling of telephone/data system installation.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Outlets: All wall outlet boxes shall be 4" Sq. x 1-1/2" D boxes flush mounted 18" above finished floor (or 6" above counter tops) and having single gang extension rings. Wall phone outlets shall be 54" above finished floor.

B. Conduits: All raceways shall have nylon pullcable installed and left in place for phone installer's use. Conduits shall comply with Section 260539 of the specifications.

C. Terminal Boards: Telephone terminal boards shall be 4' x 8' x 3/4" exterior grade plywood bolted to the walls, with their bottom 6" above the finished floor. Paint with two coats of light gray paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceway Installation: The telecommunication raceway's installation shall comply with Section 260539 of the specifications.

B. Outlets: Outlets and appropriate covers shall be supplied by Owner's telephone/data installer. Blank, 302 stainless steel covers shall be installed on any unused outlet by installer.

END OF SECTION

SECTION 28 46 21.11 - ADDRESSABLE FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Addressable fire-alarm system.
2. Fire-alarm control panel (FACP).
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. Fire-alarm notification appliances.
6. Emergency responder radio coverage system.
7. Fire-alarm remote annunciators.
8. Fire-alarm addressable interface devices.
9. Digital alarm communicator transmitters (DACTs).

1.2 DEFINITIONS

A. DACT: Digital alarm communicator transmitter.

B. FACP: Fire-alarm control panel.

C. NRTL: Nationally Recognized Testing Laboratory.

D. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, and details, including details of attachments to other Work.

3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Annunciator panel details as required by authorities having jurisdiction.
5. Detail assembly and support requirements.
6. Include voltage drop calculations for notification-appliance circuits.
7. Include battery-size calculations.
8. Include input/output matrix.
9. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
10. Include performance parameters and installation details for each detector.
11. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Seismic Performance Certificates: For FACP, accessories, and components, from manufacturer. Include the following information:

    a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
    c. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.

B. Field quality-control reports.

C. Qualification Statements: For Installer.

D. Sample Warranty: Submittal must include line-item pricing for replacement parts and labor.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:

    a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.

d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at FACP and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media and approved online or cloud solution.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamper proofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in system. Provide in box or cabinet with compartments marked with fuse types and sizes.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level III technician.
3. Obtain certification by NRTL in accordance with NFPA 72.

4. Licensed or certified by authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.

1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic design loads and unit must be fully operational after seismic event."

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ADDRESSABLE FIRE-ALARM SYSTEM

A. Description:

1. Noncoded, addressable system, with multiplexed signal transmission and horn-and-strobe notification for evacuation.

B. Performance Criteria:

1. Regulatory Requirements:

a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.

2. General Characteristics:

a. Automatic sensitivity control of certain smoke detectors.
b. Fire-alarm signal initiation must be by one or more of the following devices and systems:

1) Manual stations.
2) Heat detectors.
3) Smoke detectors.
4) Automatic sprinkler system water flow.

c. Fire-alarm signal must initiate the following actions:

1) Continuously operate alarm notification appliances.
2) Identify alarm and specific initiating device at FACP and remote annunciator.
3) Transmit alarm signal to remote alarm receiving station.
4) Switch HVAC equipment controls to fire-alarm mode.
5) Record events in system memory.

d. Supervisory signal initiation must be by one or more of the following devices and actions:

1) Valve supervisory switch.
2) Individual devices have been disabled.
3) FACP has lost communication with network.

e. System trouble signal initiation must be by one or more of the following devices and actions:

1) Open circuits, shorts, and grounds in designated circuits.
2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, or Ethernet module.
4) Loss of primary power at FACP.
5) Ground or single break in internal circuits of FACP.
6) Abnormal ac voltage at FACP.
7) Break in standby battery circuitry.
8) Failure of battery charging.
9) Abnormal position of switch at FACP or annunciator.

f. System Supervisory Signal Actions:

1) Initiate notification appliances.
2) Identify specific device initiating event at FACP and remote annunciators.
3) After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.

g. Network Communications:

1) Provide network communications for fire-alarm system in accordance with fire-alarm manufacturer's written instructions.
2) Provide network communications pathway per manufacturer's written instructions and requirements in NFPA 72 and NFPA 70.

h. Document Storage Box:

1) Description: Enclosure to accommodate standard 8-1/2-by-11-inch manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
3) Color: Red powder-coat epoxy finish.

4) Labeling: Permanently screened with 1-inch-high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
5) Security: Locked with 3/4-inch barrel lock. Provide solid 12-inch stainless steel piano hinge.

2.2 FIRE-ALARM CONTROL PANEL (FACP)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Edwards; Carrier Global Corporation.
2. Notifier; Honeywell International, Inc.
3. Siemens Industry, Inc., Building Technologies Division.

B. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.

C. Performance Criteria:

1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
2. General Characteristics:

a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
b. Include real-time clock for time annotation of events on event recorder.
c. Provide communication between FACP and remote circuit interface panels, annunciators, and displays.
d. FACP must be listed for connection to central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACP must provide minimum 500-event history log.

f. Alphanumeric Display and System Controls: Arranged for interface between human operator at FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.

1) Annunciator and Display: LCD, two line(s) of 40 characters, minimum.
2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.

g. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1) Pathway Class Designations: NFPA 72, Class B.
2) Pathway Survivability: Level 1.
3) Install no more than 50 addressable devices on each signaling-line circuit.
4) Install fault circuit isolators to comply with circuit performance requirements of NFPA 72 or with manufacturer's written instructions, whichever is more conservative.

h. Serial Interfaces:

1) One dedicated RS 485 port for central-station operation using point ID DACT.
2) One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
3) One USB port for PC configuration.

i. Smoke-Alarm Verification:

1) Initiate audible and visible indication of "alarm-verification" signal at FACP.
2) Activate approved "alarm-verification" sequence at FACP and detector.
3) Sound general alarm if alarm is verified.
4) Cancel FACP indication and system reset if alarm is not verified.

j. Notification-Appliance Circuit:

1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.
2) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.

k. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.
l. Preamplifiers, amplifiers, and tone generators must automatically transfer to backup units, on primary equipment failure.
m. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory and DACT transmitters must be powered by 24 V(dc) source.
n. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.
o. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.
p. Batteries: Sealed, valve-regulated, recombinant lead acid.

D. Accessories:

1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Edwards; Carrier Global Corporation.
2. Notifier; Honeywell International, Inc.
3. Siemens Industry, Inc., Building Technologies Division.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, breaking-glass or plastic-rod pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACP.
2. Station Reset: Key- or wrench-operated switch.
3. Able to be used in indoor areas.

2.4 SYSTEM SMOKE DETECTORS

A. Photoelectric Smoke Detectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Edwards; Carrier Global Corporation.
b. Notifier; Honeywell International, Inc.
c. Siemens Industry, Inc., Building Technologies Division.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 268.

b. General Characteristics:
1) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACP.
2) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
3) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
4) Detector address must be accessible from FACP and must be able to identify detector's location within system and its sensitivity setting.
5) Operator at FACP, having designated access level, must be able to manually access the following for each detector:

a) Primary status.
b) Device type.
c) Present average value.
d) Present sensitivity selected.
e) Sensor range (normal, dirty, etc.).

6) Detector must have functional humidity range within 10 to 90 percent relative humidity.
7) Color: White.
8) Multiple levels of detection sensitivity for each sensor.

2.5 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Audible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Edwards; Carrier Global Corporation.
   b. Notifier; Honeywell International, Inc.
   c. Siemens Industry, Inc., Building Technologies Division.

2. Description: Horns, bells, or other notification devices that cannot output voice messages.
3. Performance Criteria:

   a. Regulatory Requirements:

      1) NFPA 72.

   b. General Characteristics:
      1) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
      2) Audible notification appliances must have functional humidity range of 10 to 95 percent relative humidity.
      3) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. from horn, using coded signal prescribed in UL 464 test protocol.
      4) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Visible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Edwards; Carrier Global Corporation.
   b. Notifier; Honeywell International, Inc.
   c. Siemens Industry, Inc., Building Technologies Division.

2. Performance Criteria:

   a. Regulatory Requirements:

      1) NFPA 72.
      2) UL 1971.

   b. General Characteristics:

      1) Rated Light Output:
         a) 15/30/75/110 cd, selectable in field.

2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
3) Mounting: Wall or ceiling mounted as indicated on drawings.
4) Flashing must be in temporal pattern, synchronized with other units.
5) Strobe Leads: Factory connected to screw terminals.
6) Mounting Faceplate: Factory finished, red for wall mounted units and white for ceiling mounted units.

2.6 EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

A. Description: Emergency responder radio coverage systems use a combination of bidirectional amplifiers and distributed antenna systems to boost signals for sustaining two-way radio communications throughout a facility, including stairwells, underground tunnels, parking garages, and other challenging areas.

B. Delegated-Design Submittal: For bidding purposes, the Contractor shall engage a qualified, reputable manufacturer experienced in the design and installation of Emergency Responder Radio Coverage Systems, and obtain a quote (good for a period of 2 years) for a complete system for a building of this type and size that includes all labor, equipment, materials, conduit pathways, and roof penetrations required. This quote shall be included as an Add-alternate along with the Base Bid. After the building exterior walls, interior walls, roof, and ceilings have been installed, a test shall be done to determine if an Emergency Responder Radio Coverage System will be required. If so, the system manufacturer shall proceed with the design and installation of the Emergency Responder Radio Coverage System at the cost of the original quote.

C. Performance Criteria:

1. Regulatory Requirements:

a. In accordance with NFPA 72, emergency responder radio coverage systems must be designed, installed, and maintained in accordance with NFPA 1221.

2. General Characteristics:

a. Where emergency responder radio coverage system is used in lieu of two-way in-building wired emergency communications system, it must have pathway survivability of Level 1, 2, or 3 as defined in NFPA 72.
b. Where leaky feeder cable is used as antenna, it must neither be required to be installed in metal raceway nor meet survivability requirements.
c. Feeder and riser coaxial cables must be rated as plenum cables.
d. Feeder coaxial cables must be connected to riser coaxial cables using hybrid coupler devices of value determined by overall design.
e. Where emergency responder radio coverage system is used in lieu of two-way in-building wired emergency communications system, design of system must be approved by authorities having jurisdiction. Riser coaxial cables must be rated as riser cables and routed through 2-hour-rated enclosure.
f. Connection between riser and feeder coaxial cables must be made within 2-hour-rated enclosure, and passage of feeder cable in and out of 2-hour-rated enclosure must be firestopped to 2-hour ratings.

2.7 FIRE-ALARM REMOTE ANNUNCIATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Edwards; Carrier Global Corporation.
b. Notifier; Honeywell International, Inc.
c. Siemens Industry, Inc., Building Technologies Division.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Annunciator functions must match those of FACP for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACP, including acknowledging, silencing, resetting, and testing.

1) Mounting: Flush cabinet, NEMA 250, Type 1.

b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACP. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.8 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Edwards; Carrier Global Corporation.
b. Notifier; Honeywell International, Inc.
c. Siemens Industry, Inc., Building Technologies Division.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Include address-setting means on module.
b. Store internal identifying code for control panel use to identify module type.
c. Listed for controlling HVAC fan motor controllers.
d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTERS (DACTs)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Edwards; Carrier Global Corporation.
b. Notifier; Honeywell International, Inc.
c. Siemens Industry, Inc., Building Technologies Division.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. DACT must be acceptable to remote central station and must be listed for fire-alarm use.
b. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACP and automatically capture one telephone line and dial preset number for remote central station. When contact is made with central station(s), signals must be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter must initiate local trouble signal and transmit signal indicating loss of telephone line to remote alarm receiving station over remaining line. Transmitter must automatically report telephone service restoration to central station. If service is lost on both telephone lines, transmitter must initiate local trouble signal.
c. Local functions and display at DACT must include the following:

1) Verification that both telephone lines are available.
2) Programming device.
3) LED display.
4) Manual test report function and manual transmission clear indication.
5) Communications failure with central station or FACP.

d. Digital data transmission must include the following:

1) Address of alarm-initiating device.
2) Address of supervisory signal.
3) Address of trouble-initiating device.
4) Loss of ac supply.
5) Loss of power.
6) Low battery.
7) Abnormal test signal.
8) Communication bus failure.

e. Secondary Power: Integral rechargeable battery and automatic charger.
f. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.

B. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in normal path of egress within 60 inches of exit doorway.
2. Mount manual fire-alarm box on background of contrasting color.
3. Operable part of manual fire-alarm box must be between 42 and 48 inches above floor level. Devices must be mounted at same height unless otherwise indicated.

D. Smoke-Detector Locations:

1. HVAC: Locate detectors no closer than 36 inches from air-supply diffusers or return-air openings.
2. Lighting Fixtures: Locate detectors no closer than 12 inches from lighting fixtures and not directly above pendant mounted or indirect lighting.

E. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

F. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install no less than 6 inches below ceiling for wall mounted devices. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

H. Visible Alarm-Indicating Devices: Install at least 6 inches below ceiling for wall mounted devices. Install devices at same height unless otherwise indicated.

I. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Conductors."

B. Ground equipment in accordance with Section 260526 "Grounding."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate must be laminated acrylic or melamine plastic sign with black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

A. Pathways must be installed in EMT.

B. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

A. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inches from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.

1. Supervisory connections at valve supervisory switches.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in location visible from FACP.

3.9 GROUNDING

A. Ground FACP and associated circuits in accordance with Section 260526 "Grounding."

B. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

A. Field tests must be witnessed by authorities having jurisdiction.

B. Administrant for Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Provide video recording of training to Owner.

3.12 MAINTENANCE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service must include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies must be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections in accordance with "Visual Inspection Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in "Test Methods" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per "Testing Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.13 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement must include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software must include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

END OF SECTION

DIVISION 31 10 00 - SITE CLEARING

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. Protecting existing trees, shrubs, groundcovers, plants and grass to remain.
2. Clearing and grubbing.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
2. Division 2 Section "Tree Protection and Trimming" for protecting trees remaining on-site that are affected by site operations.
3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 SUBMITTALS

A. Photographs or videotapes, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 1 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

1.6 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 2 - EXECUTION

2.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

2.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

2.3 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

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

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer’s written permission.

C. Excavate for and remove underground utilities indicated to be removed.

2.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 12 inches below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

2. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

2.5 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

DIVISION 31 23 16 EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for performing open cut excavations to the widths and depths necessary for constructing structures, pipelines and conduits including excavation of any material necessary for any purpose pertinent to the construction of the Work.

B. Related Work Specified in Other Sections Includes:

1. Section 02230 - Site Clearing
2. Section 02223 - Backfilling

1.2 DEFINITIONS

A. Earth: “Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, wedging or special impact tools for their removal from their original beds, and removal of which can be completed using standard excavating equipment. Specifically excluded are all ledge and bedrock and boulders or pieces of masonry larger than one cubic yard in volume.

B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Dewatering Excavation Plan: Develop an excavation dewatering plan that considers site ground and groundwater conditions, the type and arrangement of the equipment to be used and the proper method of groundwater disposal. Prepare the dewatering plan before beginning excavations below groundwater. Maintain one copy of the dewatering plan at the project site to be available for inspection while all dewatering operations are underway.

3.10 SITE CONDITIONS

A. Geotechnical Investigation: A geotechnical investigation and report has been prepared by ECS Southeast, LLP on July 21, 2023.

1. This report was obtained for use by the Architect and the Civil / Structural Engineers in their designs and is not part of the Contract Documents.
2. This report and log of borings is provided for the contractor's information, but is not a warranty of subsurface conditions.
3. Additional investigation: The Contractor should visit the Site and acquaint himself/herself with Site conditions.

B. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions.

C. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of Work.

D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL

A. Clearing: Clear open-cut excavation sites of obstructions preparatory to excavation. Clearing, in accordance with Section 02 110, includes removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during trench excavation.

B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 02151.

C. Safety: Whenever an excavation site or trench is left unattended by the CONTRACTOR or when an area is not within 100 feet of observation by the CONTRACTOR, the excavation site or trench shall be filled and/or, at the OWNER's discretion, protected by other means to prevent accidental or unauthorized entry. Such protection shall include barricades and other

protection devices requested by the ENGINEER or OWNER, including temporary fencing, snow fencing, or temporary "structure" tape. Such safety items shall not relieve the CONTRACTOR of any site safety requirements or liabilities established by Federal, State and local laws and agencies, including OSHA, but is intended as additional safety measures to protect the general public.

D. Hazardous Materials: If encountered, take care of hazardous materials not specifically shown or noted in accordance with Section 01 500.

E. During excavation and any site work, storm water pollution prevention measures shall be taken to ensure that water quality criteria are not violated in the receiving water body and all state and local regulatory requirements are met.

3.2 TRENCH EXCAVATION

A. Preparation: Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Unless shown or specified otherwise, preserve all trees and large shrubs. Hold damage to the root structure to a minimum. Small shrubs may be preserved or replaced with equivalent specimens.

B. Adequate Space: Keep the width of trenches to a minimum, however, provide adequate space for workers to place, join and backfill the pipe properly.

1. The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8-inches for unsheeted trench or 12 inches for sheeted trench.

   The maximum width of trench, measured at the top of the pipe, shall not exceed the outside pipe diameter plus 2 feet, unless otherwise shown on the drawing details or approved by the ENGINEER. Trench walls shall be maintained vertically from the bottom of the trench to a line measured one foot above the top of the pipe. From one foot above the top of the pipe to the surface the trench walls shall conform with OSHA Regulations.

2. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.

3. Should the maximum trench widths specified above be exceeded without written approval, provide concrete cradle or encasement for the pipe as directed. No separate payment will be made for such concrete cradle or encasement.

C. Depth:

1. Excavate trenches to a minimum depth of 8 inches below the bottom of the pipe or the bottom of encasement for electrical ducts, unless otherwise shown, specified or directed, so that bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for duct encasement, pipe barrels and bells.

2. Standard trench grade shall be defined as the bottom surface of the utility to be constructed or placed within the trench. Trench grade for utilities in rock or other non-cushioning material shall be defined as additional undercuts backfilled with #57 stone compacted in 6-inch lifts, below the standard 8-inches minimum trench undercut. Excavation below trench grade that is not ordered in writing by the ENGINEER shall be backfilled to trench grade and compacted.

D. Unstable or Unsuitable Materials: If unstable or unsuitable material is exposed at the level of the bottom of the trench excavation, excavate the material in accordance with the subsection headed "Authorized Additional Excavation".

1. Material shall be removed for the full width of the trench and to the depth required to reach suitable foundation material.

2. When in the judgment of the ENGINEER the unstable or unsuitable material extends to an excessive depth, the ENGINEER may advise, in writing, the need for stabilization of the trench bottom with additional select fill material, crushed stone, washed shell, gravel mat or the need to provide firm support for the pipe or electrical duct by other suitable methods.

3. Crushed stone, washed shell, and gravel shall be as specified in Section 02 223.

4. Payment for such trench stabilization will be made under the appropriate Contract Items or where no such items exist, as a change in the Work.

E. Length of Excavation: Keep the open excavated trench preceding the pipe or electrical duct laying operation and the unfilled trench, with pipe or duct in place, to a minimum length which causes the least disturbance. Provide ladders for a means of exit from the trench as required by applicable safety and health regulations.

F. Excavated Material: Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall be responsible for obtaining the sites to be used and shall maintain his operations to provide for natural drainage and not present an unsightly appearance.

G. Water: Allow no water to rise in the trench excavation until sufficient backfill has been placed to prevent pipe or duct flotation.

3.3 FINISHED EXCAVATION

A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.

B. Finish Methods: Provide a degree of finish which is ordinarily obtainable from blade grade operations, except as otherwise specified in Section 02 223.

3.4 PROTECTION

A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.

B. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.

C. It shall be the CONTRACTOR’s responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment to avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the facility owner and performed to cause as little interference as possible with the service rendered by the facility disturbed. Facilities or structures damaged in the prosecution of the work shall be repaired and/or replaced immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the CONTRACTOR’s expense.

D. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Division 1.

E. 4 materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.5 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.

B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.

C. Excess Materials: CONTRACTOR shall be responsible for transporting and disposal of surplus excavated material and excavated material unsuitable for backfilling or embankments at an offsite disposal location secured by the CONTRACTOR.

3.12 REMOVAL OF WATER

A. Water Removal: At all times during the excavation period and until completion and acceptance of the WORK at final inspection, provide ample means and equipment with which to remove promptly and dispose of properly all water entering any excavation or other parts of the WORK.

B. Dry Excavations: Keep the excavation dry.

C. Water Contact: Allow no water to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.

D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other work under construction.

E. Protection: Provide adequate protection for water discharged onto streets. Protect the street surface at the point of discharge.

F. Sanitary Sewers: Discharge no water into sanitary sewers.

G. Storm Sewers: Discharge no water containing settleable solids into storm sewers.

H. Repair: Promptly repair any and all damage caused by dewatering the Work.

END OF SECTION

DIVISION 31 23 23 - BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. General Requirements: Backfill all excavation to the original surface of the ground or to such other grades as may be shown or required. For areas to be covered by topsoil, leave or stop backfill (12) inches below the finished grade or as shown. Obtain approval for the time elapsing before backfilling against masonry structures. Remove from all backfills any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces from the excavated space before backfilling is started. Leave sheeting and bracing in place or remove as the work progresses.

B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified providing the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

C. Related Work Specified In Other Sections Includes:

1. Section 02230 - Site Clearing
2. Section 02222 – Excavation – Earth and Rock

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-in Drop

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL - GENERAL

A. General: Backfill with sound materials, free from waste, organic matter, rubbish, boggy or other unsuitable materials.

B. General Materials Requirements: Conform materials used for backfilling to the requirements specified. Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.

C. Frozen Materials: Do not use frozen material for backfilling.

2.2 DRAINAGE FILL

A. Materials for Drainage Fill: Use clean gravel, crushed stone, or other suitable material conforming to the gradation specified for drainage fill. Clay and fine particles are unacceptable in drainage fill. Provide drainage fill of a grade between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	45-65
#4	5-15
#16	0-4

2.3 SELECT FILL

A. Materials for Select Fill: Use clean gravel, crushed stone, washed shell, or other granular or similar material as approved which can be readily and thoroughly compacted to 95 percent of the maximum dry density obtainable by ASTM D 1557.

1. Allowed Materials: Grade select fill between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Unallowed Materials: Very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

2.4 COMMON FILL

A. Materials for Common Fill: Material from on-site excavation may be used as common fill provided that it can be readily compacted to 90 percent of the maximum dry density obtainable by ASTM D 1557 and does not contain unsuitable material. Select fill may be used as common fill at no change in the Contract Price.

B. Granular Materials On-Site: Granular on-site material, which is fairly well graded between the following limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing by Weight
3 inch	100
#10	50-100
#60	20-90
#200	0-20

C. Cohesive Materials On-Site: Cohesive site material may be used as common fill.

1. The gradation requirements do not apply to cohesive common fill.

2. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.

D. Material Approval: All material used as common fill is subject to approval. If there is insufficient on-site material, import whatever additional off-site material is required which conforms to the specifications and at no additional cost.

PART 3 EXECUTION

3.1 PIPE BEDDING AND INITIAL BACKFILL

A. Hand Placement: Place select fill by hand for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.

B. Stone Placement: Do not place large stone fragments in the pipe bedding or backfill to 1 foot over the top of pipes, nor nearer than 2 feet at any point from any pipe, conduit or concrete wall.

C. Unallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet is unacceptable.

3.2 TRENCH BACKFILL

A. General: Backfill material shall be clean earth fill composed of sand, clay and sand, sand and stone, crushed stone, or an approved combination thereof. Backfilling shall be accomplished under two specified requirements: First Lift, from trench grade to a point 12 inches above the top of the utility, and, Second Lift, from the top of the First Lift to the ground surface. Where thrust blocks, encasements, or other below-grade concrete work have been installed, backfilling shall not proceed until the concrete has obtained sufficient strength to support the backfill load.

B. First Lift: Fine material shall be carefully placed and tamped around the lower half of the utility. Backfilling shall be carefully continued in compacted and tested layers not exceeding 6 inches in thickness for the full trench width, until the fill is 12 inches above the top of the utility, using the best available material from the excavation, if approved. The material for these first layers of backfill shall be lowered to within 2 feet above the top of pipes before it is allowed to fall, unless the material is placed with approved devices that protect the pipes from impact. The "First Lift" shall be thoroughly compacted and tested before the "Second Lift" is placed. Unless otherwise specified, compaction shall equal 98% of maximum density, as determined by ASTM D 1557. The "First Lift" backfill shall exclude stones, or rock fragments larger than the following Greatest Dimension-Inches:

Pipe Type	**Fragment Size (Inches)**
Steel	2
Concrete	2
Ductile Iron	2
Plastic	1
Fiberglass	1

C. Second Lift: The remainder of the trench, above the "First Lift", shall be backfilled and tested in layers not exceeding 6 inches. The maximum dimension of a stone, rock, or pavement fragment shall be 6 inches. When trenches are cut in pavements or areas to be paved, compaction, as determined by ASTM D 1557, shall be equal to 98% of maximum density, with compaction in other areas not

less than 95% of maximum density in unpaved portions of the Rights-of-Way or 90% of maximum density in other areas.

D. Compaction Methods: The above specified compaction shall be accomplished using accepted standard methods (powered tampers, vibrators, etc.), with exception that the first two feet of backfilling over the pipe shall be compacted by hand-operated tamping devices. Flooding or puddling with water to consolidate backfill is not acceptable, except where sand is the only material utilized and encountered and the operation has been approved by the OWNER.

E. Dropping of Material on Work: Do trench backfilling work in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.

F. Distribution of Large Materials: Break lumps up and distribute any stones, pieces of crushed rock or lumps which cannot be readily broken up, throughout the mass so that all interstices are solidly filled with fine material.

3.5 STRUCTURE BACKFILL

A. Use of Select Fill: Use select fill underneath all structures, and adjacent to structures where pipes, connections, electrical ducts and structural foundations are to be located within this fill. Use select fill beneath all pavements, walkways, and railroad tracks, and extend to the bottom of pavement base course or ballast.

1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.

2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.

B. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.

1. Extend such backfill from the bottom of the excavation or top of bedding to the bottom of subgrade for lawns or lawn replacement, the top of previously existing ground surface or to such other grades as may be shown or required.

2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.

3. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

3.10 FINISH GRADING

A. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown and blend into conformation with remaining natural ground surfaces.

1. Leave all finished grading surfaces smooth and firm to drain.

2. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.

B. Surface Drainage: Perform grading outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.11 RESPONSIBILITY FOR AFTER-SETTLEMENT

A. After-settlement Responsibility: Take responsibility for correcting any depression which may develop in backfilled areas from settlement within one year after the work is fully completed. Provide as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.12 INSPECTION AND TESTING OF BACKFILLING

A. Sampling and Testing: Provide sampling, testing, and laboratory methods in accordance with the appropriate ASTM Standard Specification. Subject all backfill to these tests.

B. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.

C. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and re-compaction in place prior to placement of a new lift.

END OF SECTION

This page intentionally left blank

SECTION 31 31 00 - SOIL TREATMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References, are included as a part of this Section as though bound herein.

1.2 SUMMARY:

A. Provide labor, material, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Pre-construction soil treatment for underslab and foundation wall perimeters.

1.3 REFERENCES

A. Refer to specification Section 01 41 00 - Regulatory Requirements, for code requirements and code standards applicable to all materials and work necessary to complete the scope of work.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Chemicals and products used.
   2. Application instructions.
   3. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.
   4. Information that soil treatment conforms to specified requirements.

B. Provide information regarding the type of equipment to be used to apply the soil treatment, size of volume mixing tank, the pump capacity in gallons per minute, and the application tools with in-line flow meter devices attached.

C. Certificate of Compliance: Submit as part of the Closeout Documents a statement indicating that the building has received a complete treatment for the prevention of subterranean termites in accordance with governing States rules.

D. Submit job site log book.

E. Submit sample warranty.

1.5 QUALITY ASSURANCE

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

B. Engage a professional pest control operator who is licensed according to regulations of the State of South Carolina.

C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.6 FIELD CONDITIONS

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

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

C. Comply with other handling and application instructions of the soil toxicant manufacturer.

D. Unless treated areas are to be immediately covered, take precautions to prevent disturbance of treatment by human or animal contact.

1.7 REGULATORY REQUIREMENTS

A. Provide minimum requirements for application as authorized by the State of South Carolina to fulfill the work according to manufacturer's specifications.

B. Conform to applicable code for requirements and for application in accordance with the EPA.

1.8 PROJECT RECORD DOCUMENTATION

A. Log Book to be kept at job site and to include:
   1. Project name
   2. Company providing treatment
   3. Applicator's name
   4. Time of arrival and departure
   5. Product name
   6. Record date of all applications
   7. Rate of application to all required areas of the designated site
   8. All areas to be treated
   9. The soil treatment trade name
   10. Quantity of concentrate delivered to the site
   11. Quantity used for the designated treated areas
   12. The percentage of active ingredient in diluted form
   13. Finished gallons of soil treatment for each application
   14. Linear and square footage amount to determine total finished soil treatment used

1.9 DELIVERY

A. The State Registered products must be delivered to the jobsite in the original sealed and labeled containers of the manufacturer. Use a synthetic dye for proper identification on the surface areas treated.

1.10 WARRANTY

A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

B. Warranty Period: Five (5) years from Date of Substantial Completion, or the minimum more than five (5) years if prevailing local laws require.

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 requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and basis of design shall be one of the following. However, products of other manufacturers will be considered for acceptance, provided they equal or exceed the material requirements and functional qualities of the specified product, and acceptance is provided by the Architect in writing prior to bidding.
   1. BASF Environmental Science
   2. Bayer Environmental Science

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00.0 – Product Requirements regarding requirements of substitutions to be considered.

2.2 SOIL TREATMENT SOLUTION

A. Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Fuel oil will not be permitted as a dilutent. Provide a solution consisting of one of following chemical elements.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Termidor SC as manufactured by BASF.
      b. Premise 75 as manufactured by Bayer.

B. Dilute with water to concentration level recommended by manufacturer.

C. A green/blue dye shall be added to the mix for identification.

PART 3 EXECUTION

3.1 SOIL TREATMENT SOLUTION

A. EPA and South Carolina Department of Agriculture & Consumer Services approved emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites.

B. Fuel oil is not permitted as a diluent.

C. Use only soil treatment solutions, which are not injurious to planting or protected wildlife.

3.2 INSPECTION

A. Before applying soil treatment for termites, examine areas and conditions; notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
   1. Do not proceed with the work until conditions are satisfactory.

B. Verify that final grading is complete.

C. Examine the substrates and conditions under which work of this section will be performed. Do not proceed until unsatisfactory conditions detrimental to timely and proper completion of the work have been corrected.

D. Verify that the site conditions under the slab(s) are proper for the installation of termite barrier system as specified and in accordance with manufacturer’s printed instructions. Prior to installation, verify that:
   1. The ground has been cleared of wood scraps such as ground stakes, forms, and other termite food sources.
   2. The work area has been filled with finely graded soil consisting of particle sizes no larger than 1 inch (25.4 mm) and compacted to eliminate soil movement.
   3. Footings and foundations, and outer forms are in place.
   4. Communications, electrical, and plumbing penetrating pipes are in place.
   5. Sand system: Prior to placing material, remove visible plant roots and standing water from the excavated area. Verify that utility trenches are sufficiently wide to permit adequate cover under, around, and over pipes and conduit that will be encapsulated with the termite sand barrier. Verify that the foundation perimeter has sufficient room between the sides of excavations and edges of foundations to provide the required barrier depth and width.

3.3 GENERAL

A. Surface Preparation:
   1. Remove foreign matter that could decrease effectiveness of treatment on areas to be treated.
   2. Loosen, rake and level soil-requiring treatment, except previously compacted areas under slabs and foundations.

B. Application Rates: Apply soil treatment solution as specified and in strict accordance with Manufacturer's recommendation for mixing and application.

1. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.
2. Post signs in the areas of application warning workers of soil poisoning.
   a. Remove signs before other construction covers the treated areas.
3. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following initial application.

3.4 APPLICATION

A. Apply soil treatment chemical to soil and earth which will be covered by or lie adjacent to buildings. Treat foundations. Treat areas around pipes and conduits penetrating slabs on fill to provide a lethal barrier to subterranean termites.

B. Apply chemical solution after subgrade has been made ready for placement of any floor slab vapor barrier, and as soon as practical prior to placement of concrete slabs and caps on masonry piers. Apply treatment only after all piling, pile caps, grade beams, foundation walls, and below grade waterproofing shall have been completed.

C. Apply treatment at least 12 hours prior to placement of concrete slabs during normal working hours in order to be subject to inspection. Notify applicator at least 24 hours prior to time application of chemical will be required.

D. Apply termiticide mixture to the following:
   1. Soil and earth that will be covered by the buildings and soil and earth that is within 5' of the buildings.
   2. Foundations.
   3. Areas around pipes and conduits penetrating slabs on fill to provide lethal barrier to subterranean termites.

3.5 SOIL CONDITIONS

A. Apply chemical when moisture content of soil is sufficiently low to allow uniform distribution of chemical throughout specified areas.

END OF SECTION

DIVISION 32 12 00 - HOT-MIX ASPHALT PAVING

PART 3 - GENERAL

3.1 RELATED DOCUMENTS

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

3.2 SUMMARY

A. This Section includes the following:
   1. Hot-mix asphalt patching.
   2. Hot-mix asphalt paving overlay.
   3. Asphalt surface treatments.
   4. Pavement-marking paint.

B. Related Sections include the following:

   1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

3.3 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. SCDOT: South Carolina Department of Transportation.

3.4 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local SCDOT.

   1. Standard Specification: SCDOT Standard Specifications for Highway Construction.

   2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

3.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international graphics symbol, spaces dedicated to people with disabilities.

D. Material Certificates: For each paving material, signed by manufacturers.

3.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. The manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.

C. Regulatory Requirements: Comply with SCDOT Standard Specifications for Highway Construction for asphalt paving work.

D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

3.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within the temperature range required by manufacturer. Protect stored materials from direct sunlight.

3.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.

2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 4 - PRODUCTS

4.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: In accordance with SCDOT Section 401.

C. Fine Aggregate: In accordance with SCDOT Section 401.

D. Reduce the percentage of natural sand to 10 percent if slow, heavily loaded traffic is anticipated.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

4.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP 1, PG 64-22.

B. Prime Coat: Asphalt emulsion prime complying with SCDOT requirements.

C. Tack Coat: AASHTO M 140, emulsified asphalt or AASHTO M 208, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Water: Potable.

4.3 AUXILIARY MATERIALS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.

1. Color: As indicated

2. Wheel Stops: N/A

4.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction in accordance with SCDOT Standards, and complying with the following requirements:

   a. Base Course: Stabilized Aggregate Base Course
   b. Surface Course: Type 1

PART 5 - EXECUTION

5.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

5.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

5.3 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

5.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of the unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow the prime coat to cure for 72 hours minimum.

1. If the prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow the tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

5.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.

3. Spread mix at a minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After the first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

5.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with the same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

5.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling

for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After the final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

5.8 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1-1/2 inch, no minus.

A. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

3. Surface Course: 1-1/2 inch.

5.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal.

5.10 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

5.11 FIELD QUALITY CONTROL

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

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily

to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

5.12 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

    1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

This page intentionally left blank

DIVISION 32 92 00 LAWN RESTORATION

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. The work in this section consists of furnishing all labor, material and equipment to replace and maintain all areas disturbed during construction by establishing a stand of grass, within the areas called for by the furnishing and placing grass sod, or seeding, or seeding and mulching.

1.2 REFERENCE DOCUMENTS

A. The materials used in this work shall conform to the requirements of SCDOT Specifications:

PART 2 PRODUCTS

2.1 SODDING

A. Types: Sod may be of centipede grass or as that disturbed, as established prior to construction. It shall be well matted with roots. When replacing sod in areas that are already sodded, the sod shall be the same type as the existing sod.

B. Sod shall be provided as required in accordance with SCDOT Specifications. The CONTRACTOR shall furnish sod equal to and similar in type as that disturbed. Placement and watering requirements shall be in accordance with SCDOT Specifications.

C. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 24inch or larger, except where 6-inch strip sodding is called for.

D. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted.

E. Sod should be handled in a manner to prevent breaking or other damage. Sod shall not be handled by pitch forks or by dumping from trucks or other vehicles. Care shall be taken at all times to retain the native soil on the roots of each sod

roll during stripping and handling. Sod that has been damaged by handling during delivery, storage or installation will be rejected.

2.2 FERTILIZER

A. Chemical fertilizer shall be supplied in suitable bags with the net weight certification of the shipment. Fertilizer shall be 10-10-10.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 10-10-10, with at least 50 percent of the nitrogen from a nonwater-soluble organic source. The nitrogen source may be a urea-formaldehyde source provided it is not derived from a waste product of the plastic industry.

2.3 EQUIPMENT

A. The device for spreading fertilizer shall be capable of uniformly distributing the material at the specified rate.

2.4 NETTING

A. Netting is fabricated of material similar to Geoscope Landscape Fabric or approved equal.

2.5 GRASSING

A. The CONTRACTOR shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with SCDOT Specifications. The grassed areas shall be mulched and fertilized in accordance with SCDOT Specifications.

2.6 TOPSOIL

A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the OWNER. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants, and grassing specified herein.

2.7 WATER

A. It is the CONTRACTOR'S responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. The CONTRACTOR shall make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs for his work. He shall also furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

PART 3 EXECUTION

3.1 SOD BED PREPARATION

A. Areas to be sodded and/or seeded shall be cleared no all rough grass, weeds, and debris, and brought to an even grade.

B. The soil shall then be thoroughly tilled to a minimum 8-inch depth.

C. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.2 INSPECTION

A. Verify that soil preparation and related preceding work has been completed.

B. Do not start work until conditions are satisfactory.

3.3 SOD HANDLING AND INSTALLATION

A. During delivery, prior to planting, and during the planting of sod areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and planting so as not to be damaged by sweating or excessive heat and moisture.

B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.

C. Sod shall be placed at all areas where sod existed prior to construction, on slopes of 3 horizontal on 1 vertical (3:1) or greater, in areas where erosion of soils will occur, and as directed by the ENGINEER. On areas where the sod may slide, due to height and slope, the ENGINEER may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.

3.4 SOD MAINTENANCE

A. The sod shall produce a dense, well-established growth. The CONTRACTOR shall be responsible for the repair and re-sodding of all eroded or bare spots until project acceptance. Repair to sodding shall be accomplished as in the original work.

B. Sufficient watering shall be done by the CONTRACTOR to maintain adequate moisture for optimum development of the seeded and sodded areas. Sodded areas shall receive no less than 1.5 inches of water per week for at least 2 weeks. Thereafter, the CONTRACTOR shall apply water for a minimum of 60 days as needed until the sod takes root and starts to grow or until final acceptance, whichever is latest.

3.5 CLEANING

A. Remove debris and excess materials from the project site.

END OF SECTION

DIVISION 33 06 00 - HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) gravity pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.

1.2 REFERENCED STANDARDS

A. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

1.3 QUALIFICATIONS

A. All HDPE pipe, fittings, and appurtenances shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.

1.4 SUBMITTALS

A. Submit to the ENGINEER, a list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for all HDPE pipe and fittings.

B. Submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

C. Submit shop drawings showing installation method and the proposed method and specialized equipment to be used.

1.5 INSPECTIONS AND TESTS

A. All work shall be inspected by an Authorized Representative of the OWNER who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the ENGINEER or his authorized representative, shall, by written notice, order further construction to cease until all deficiencies are corrected.

1.6 WARRANTY AND ACCEPTANCE

A. Warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one-year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one-year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, they shall be corrected by the CONTRACTOR without additional charge to the OWNER before final acceptance. During the warranty period, the ENGINEER shall determine if warranty repairs or replacement work shall be performed by the CONTRACTOR. The decision of the ENGINEER shall be binding upon the CONTRACTOR.

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE AND FITTINGS

A. HDPE pipe shall be manufactured from an engineered compound of virgin and recycled high density polyethylene conforming with the minimum requirements of cell classification 424420C (ESCR Test Condition B) for 4- through 10-inch (100 to 250 mm) diameters, and 435420C (ESCR Test Condition B) for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%.

B. Qualification of Manufacturer: The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications. The Manufacturer’s production facilities shall be open for inspection by the OWNER or his authorized representative. Qualified manufacturers shall be approved by the OWNER.

C. Approved Manufacturer: Manufacturers that are qualified and approved are listed below:

Advanced Drainage Systems

D. Interchangeability of Pipe and Fittings: HDPE pipe and fittings shall be produced by the same Approved Manufacturer. Products made by subcontractor’s or Manufacturer’s distributor are not acceptable. Pipe and fittings from different Approved Manufacturers shall not be interchanged.

E. Color Identification: HDPE must have at least three equally spaced horizontal colored marking stripes. Permanent identification of piping service shall be

provided by adhering to the following colors (in accordance with the coloring code in Section 9900).

Blue – potable water
Green – wastewater, sewage
Pantone Purple – reuse or reclaimed water

F. Fittings and Custom Fabrications: Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a welded bell and valley or saddle gasket meeting the watertight joint performance requirements of ASTM F2306.

G. Joint Performance: Pipe shall be joined using a bell & spigot joint meeting ASTM F2648. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

2.2 MANUFACTURER'S QUALITY CONTROL

A. The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The cell classification properties of the material shall be certified by the supplier and verified by Manufacturer's Quality Control. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing materials shall be checked for:

- Outside diameter, wall thickness, and eccentricity as per ASTM D2122 at a frequency of at least once/hour or once/coil, whichever is less frequent.
- Out of Roundness at frequency of at least once/hour or once/coil, whichever is less frequent.
- Straightness, inside and outside surface finish, markings and end cuts shall be visually inspected as per ASTM F714 on every length of pipe.

2.3 COMPLIANCE TESTS

A. In case of conflict with Manufacturer's certifications, the CONTRACTOR, ENGINEER, or OWNER may request re-testing by the manufacturer or have re-tests performed by an outside testing service. All re-testing shall be at the requestor's expense and shall be performed in accordance with the Specifications.

B. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

PART 3 EXECUTION

3.1 INSTALLATION OF HIGH-DENSITY POLYETHYLENE GRAVITY PIPE AND FITTINGS

A. All high-density polyethylene (HDPE) gravity pipe shall be installed by direct bury, directional bore, or a method approved by the OWNER/ENGINEER prior to construction. If directional bore is used, or if directed by the OWNER/ENGINEER, the entire area of construction shall be surrounded by silt barriers during construction.

B. Installation shall be in accordance with Manufacturer's recommendations, and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

3.2 EXCAVATION

A. Trench excavations shall conform to this specification, Section 2222, the plans and drawings, as otherwise authorized in writing by the ENGINEER or his approved representative, and in accordance with all applicable codes. Excess groundwater shall be removed by the CONTRACTOR. Where necessary, trench walls shall be shored or reinforced.

3.8 FOUNDATION AND BEDDING

A. Pipe shall be laid on grade and on a stable foundation in accordance with Section 02 223.

3.9 PIPE HANDLING

A. When lifting with slings, only wide fabric choker slings shall be used to lift, move, or lower pipe and fittings. Wire rope or chain shall not be used. Slings shall be of sufficient capacity for the load and shall be inspected before use. Worn or defective equipment shall not be used.

3.10 TESTING

END OF SECTION

DIVISION 33 10 00 WATER DISTRIBUTION SYSTEMS

Part 1 - General

1.00 SECTION INCLUDES

A. Water main piping, fittings and accessories

B. Pressure testing and sterilization

1.01 STANDARDS

The standards listed below are included in these specifications by reference. Specifications cited shall refer to the latest standards revision under the same specification number, or to a superseding specification under a new number, except for provisions in revised specifications which are clearly inapplicable.

A. AWWA/ ANSI C150/ A21.50 - Thickness Design of Ductile-Iron Pipe
B. AWWA/ANSI C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water and other Liquids
C. AWWA/ ANSI C104/ A21.4 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water
D. AWWA/ ANSI C111/21.11 - Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
E. AWWA/ANSI C110/A21/10 - Ductile-Iron and gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids
F. AWWA/ANSI C105/A21.5 - Polyethylene Encasement for Ductile Iron Pipe Systems
G. AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances
H. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe
I. ASTM D 2241 - Polyvinyl Chloride (PVC) Pressure Pipe
J. AWWA C502 - Dry Barrel Fire Hydrants
K. AWWA C508 - Swing-Check Valves for Waterworks Service, 2" through 24" NPS
L. AWWA C509 - Resilient Seated Gate Valves for Water and Sewerage Systems
M. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63" for water distribution
N. AWWA M23 - PVC Pipe Design and Installation
O. ASTM D 2774 - Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
P. AWWA C651 - Disinfecting Water Mains

1.02 REGULATORY REQUIREMENTS

A. Conform to all applicable SC DES Regulations for materials and installation for Water Construction

B. All materials/products that contact potable water must be third party certified as meeting ANSI/NSF 61. The certifying party shall be accredited by ANSI/NSF.

C. All pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to AWWA Standards, Section C.

1.03 SPECIAL DESIGN ISSUES

A. Soil or Groundwater Contamination - Water mains shall be designed to avoid installation within contaminated areas where feasible. Unavoidable installations within a contaminated area shall utilize ductile iron pipe with chemical resistant gaskets.

B. Wastewater treatment systems - Water mains shall not be installed within 25-feet (horizontally) of any wastewater spray field or drain tile field.

C. Waterbody crossing:

1. All water mains that cross above a water body shall be readily accessible, adequately supported, anchored, and protected from freezing. Crossing above a water body shall only be allowed as shown on the plans or specified by the Engineer.

2. All water mains that cross beneath a water body shall be installed with a minimum of 3-feet of cover below the channel. Crossings greater than 15-feet wide shall be designed using ductile iron pipe with joints designed to accommodate anticipated deflection or movement. Directional drilled crossings may be installed using HDPE as specified and directed by the Engineer. Valves shall be located at an accessible location (flood proof) on each side of the crossing. A properly sized blow-off shall be installed on the crossing side opposite the water supply.

1.04 SUBMITTALS - Submit the following in accordance with plans.

A. Submit product data for pipe, fittings, joints, valves, fire hydrants and accessories.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspect materials delivered to the site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep the insides of pipe, fittings, valves and hydrants free of dirt and debris.

B. Handle pipe, fittings, valves, hydrants and other accessories in a manner to ensure delivery to the trench in a sound, undamaged condition. Take special care to avoid injury to coatings and linings on pie and fittings; make satisfactory repairs if coatings or linings are damaged.

Part 2 - Products

2.01 MANUFACTURERS

A. Pipe and Fittings

1. US Pipe
2. Griffin Pipe Product Company
3. American Cast Iron Pipe Company
4. McWane Cast Iron Pipe
5. JM Pipe and Pipe Product

B. Valves

1. DeZURIK Valve
2. Clow Valve Company
3. Mueller Company
4. M ft H
5. Rockwell International

C. Substitutions: As specified on plans by the Engineer

2.02 GENERAL

A. These specifications shall apply to the materials to be furnished and installed to complete the water line installation in accordance with the drawings.

B. All pipe and fittings shall be of the class and type as indicated on the drawings and/or proposal and designated herein.

C. The Engineer shall not permit intermixing of different types of pipe unless specified on the drawing or with approved written permission.

D. All pipe shall be new, of first quality with smooth interior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length. Previously used pipe shall not be allowed.

E. All pipe shall be subject to the inspection by the Engineer at the pipe plant, trench, or point of delivery, for purpose of culling and rejecting of any pipe (independent of laboratory test), which does not conform to the requirements of these specifications. The Engineer shall mark such pipe, and the Contractor shall remove it from the project site upon notice being received of its rejection.

F. All water main materials shall conform to one or more of the specifications cited for each material classification noted below.

G. Lubricants, natural rubber or other material which will support microbiological growth shall not be used on any pipe, fitting, valve, meter, etc. that may be exposed to potable water.

H. Vegetable shortening shall not be used to lubricate pipes, gaskets or joints.

2.03 WATER MAIN MATERIALS

A. Ductile Iron Pipe:

1. Pipe sizes 12" and under shall be Pressure Class 150, 14" and greater shall be Pressure Class 250 or better. All ductile iron pipes shall be cement- mortar lined and conform to the following standard specifications: AWWA/ ANSI C104/ A21.9, AWWA/ ANSI C151 / A21.51.

2. Pipe shall be Mechanical, Push-On, Flanged, or Boltless ball joint (as needed or as shown on the plans) and conform to standard AWWA/ ANSI C111/A21.11.

3. Boltless ball joints shall lock and be watertight and permit a deflection of up to 15 degrees. The locking device shall include a spherical socket, spherical retainer and locking wedge.

4. All pipe material, solder and flux, shall be lead free (less than 0.2 percent lead in solder and flux, and less than 8.0 percent lead in pipes and fittings).

B. Polyvinyl Chloride (PVC) Pipe:

1. PVC Pressure Pipe shall be in accordance with the requirements of ASTM D 2321, latest revision; ASTM D 2241, latest revision; ASTM D 1784, latest revision; and shall bear the National Sanitation Foundation Seal.

2. Pipe 4 inches through 12 inches in diameter shall be Class 150 • C900 (AWWA C900) or as noted in the proposal.

3. Pipe larger than 12 inches in diameter shall be Class 165 - C905 (AWWA C905) or as noted on the proposal.

4. Pipe less than 4 inches in diameter shall be rated for 160 psi (SDR 26)

5. Rubber rings shall be of uniform solid cross-section and conform to ASTM D 1869 or the manufacturer's recommendations. Solvent welding pipe and fittings shall not be allowed.

C. Polyethylene (PE) Plastic Piping - Pipe and heat-fusion fittings shall conform to ASTM D 1869 or the manufacturer's recommendations. Solvent welding pipe and fittings shall not be allowed.

D. Alternate Pipe Materials - Pipe that is not specified herein such as asbestos cement, steel, etc. shall not be installed unless otherwise shown on the Plans, approved by the Engineer and approved within the SC DES construction permit.

E. Gate Valves:

1. Water main valves 12 inches in diameter and smaller shall be resilient seated wedge type gate valves (unless otherwise noted) and conform to AWWA Standard C509 as latest revised.

2. Gate valves shall be of the non-rising stem type with O-ring seals or the rising stem type (OSftY) with conventional type packing.

3. Gates shall be encapsulated in rubber where exposed to line velocity, be field replaced and provide a dual seal on the mating body seat.

4. Gate valves shall be furnished with flanged or mechanical joint type end connections.

5. Gate valves shall be epoxy coated, painted inside and out by the valve manufacturer.

6. All gate valves shall be equipped with a standard 2-inch square operation nut unless otherwise noted.

7. Gate valves shall be rated for 200-psi water working pressure and 400-psi hydrostatic test pressure.

8. Gate valves shall be Mueller, Clow, American Cast Iron Pipe Company (American Darling), MftH or equivalent.

F. Butterfly valves:

1. All butterfly valves shall be AWWA mechanical joint, BAW resilient seat butterfly valves.

2. Butterfly valves shall be epoxy coated, painted by the valve manufacturer.

3. Butterfly valves shall be used for water mains 14 inches in diameter and larger.

4. Butterfly valves shall be made to open to the left and shall have a 2" square operating nut upon the end of the stem with the direction arrow clearly and plainly cast thereon.

5. All butterfly valves shall be gear actuated.

G. Tapping Sleeves ft Valves

1. Tapping sleeves shall be JCM 432 all stainless steel or approved equivalent.

2. All tapping sleeves shall be for cast iron, ductile iron or PVC pipe (unless otherwise noted).

3. All tapping valves shall be Mueller model H-687 or equivalent.

4. Tapping valves shall have a standard 2-inch square operating nut.

5. All tapping valves shall be resilient seat valves.

H. Valve Box

1. Valve boxes shall be at 5 1/4" in diameter, cast iron, adjustable screw type with extension to grade. The cast iron box shall have a heavy coat of bituminous paint.

2. As required, extension stems shall be provided to raise valve operating nut to 36 inches below grade.

3. Each valve box is to be mounted flush with the proposed grade.

4. Crushed stone backfill will be required between and around the valve and valve box.

5. Valve boxes in grassed areas shall have a pre-cast concrete collar mounted flush with the final grade.

6. Valve boxes in pavement areas shall be brought flush with the proposed pavement elevation.

7. Valve boxes are to have the word "WATER" cast on the top cover.

I. Fire Hydrants

1. Fire hydrants shall be traffic type, dry barrel, conforming to AWWA Standard C502 - "Fire Hydrant for Ordinary Waterworks Service", approved by the National Board of Fire Underwriters with National Standard Threads.

2. Hydrant shall have a breakaway barrel set for 3 feet of cover.

3. Hydrant shall be equipped with 6" mechanical joint bottom hub, strapping lugs, "O" ring seals and an operating stem with 2-inch solid operation nut.

4. Main valve will be 5 1/4" and its seat shall have bronze-to-bronze threads into hydrant shoe.

5. Each hydrant shall have one 4 1/2" pumper connection and two 2 1/2" national standard threaded hose connections.

6. Hydrant shall be oil lubricated.

7. Hydrant shall be dry bonnet type and be provided with a drain outlet for draining when the valve is closed.

8. Hydrant shall open left and be rated at 150 psi working pressure and 300 psi test pressure.

9. Hydrants shall be as specified on the drawing details.

J. Sleeve-Type Mechanical Couplings

1. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets.

2. The middle and follower rings shall be true circular sections free from irregularities, flat spots, and surface defects.

3. The middle ring shall be of cast iron and the follower rings shall be of ductile iron and conform to ASTM A47 and ASTM A 536 respectively.

4. Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for mechanical joint gaskets in AWWA C111 / A21.11.

5. Bolts shall be round-head square-neck type bolts, ANSI B18.5.1M and ANSI/ ASME B18.4.2.2M with hex nuts.

6. Bolt shall be 5/8" diameter.

7. Minimum number of bolts for each pipe size should be as follows:

Pipe Size	# of Bolts
4”	4
6”	5
8”	6
10”	7
12” and 14”	8
16”	9
18”	10
20”	12
22”	13
24”	14

8. Bolt holes in follower rings shall be a shape to hold fast the necks of the bolts used.

9. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used except where pipeline is adequately anchored to resist tension pull across the joint.

K. Tracer Wire for Non-Metallic Piping

1. Provide blue-coated copper wire not less than 12" gauge in sufficient length to be continuous over each separate run of non-metallic pipe.

2. All mains shall be detectable within 3 feet, using electronic locating equipment.

2.04 PIPE ACCESSORIES

A. Fittings: All fittings shall be ductile iron, mechanical joint to suit pipe size and material in required tees, bends, elbows, reducers and other configurations required unless otherwise shown on drawings.

B. Mechanical joint restraints shall be installed for all tees, bends and plugs on all water lines larger than two inches. Mechanical joint restraints shall be installed on all fire hydrants and post hydrants. Refer to plans for material and installation requirements. Concrete blocking shall not be used for thrust restraints.

2.05 WATER SERVICES

A. Water services shall be as specified on the plans and standard detail drawings.

B. Water services are to have a minimum of 30" of cover over the line.

C. Plastic piping shall bear the seal of the national sanitation foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.

D. Polyvinyl Chloride (PVC) plastic piping must have an SDR rating to provide 150 psi minimum pressure rating and meet the requirements of ASTM D 1785, Schedule 40; or ASTM D 2241. The pipe and fittings shall be of the same PVC plastic material. Solvent cement shall be in accordance with ASTM D 2564.

2.06 FILL MATERIAL

Continuous and uniform bedding shall be required within the trench for all pipe installations. Backfill material shall be placed and tamped in uniform layers around the pipe and to a sufficient height above the pipe for adequate protection and support. Rock or stone shall not be placed within six inches of the pipe, except for the specified stone bedding material.

A. Ductile Iron Pipe: Approved subsoil as specified on plans.

B. Polyvinyl Chloride (PVC) and High-Density Polyethylene (HOPE) Plastic Pipe: Bed in accordance with bedding detail on the drawings using specified material.

Part 3 - Execution

3.01 GENERAL

A. The Contractor shall furnish all material and labor and construct the water lines as shown on the drawings, including all clearing, grubbing, excavating, sheathing, backfilling and other appurtenances.

B. The work shall include all ditching, diking, pumping, bailing, draining, flushing, testing and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables and other structures.

C. The Contractor shall be responsible for the cleaning away of all rubbish and surplus materials upon completion of the work required to build and put in complete working order the specified water lines and all structures appertaining thereto.

D. All water lines and appurtenances shall be cleared of all foreign debris.

E. Pipe shall be installed with a standard cover depth of 36-inches unless otherwise directed by the Engineer. Minimum cover of 30-inches shall be always maintained. Thermoplastic piping shall not be installed with less than 30-inch cover under any circumstance.

3.02 ORDER OF WORK

A. The Owner reserves the right to direct the Contractor as to which portions of work should be constructed first, and upon the order of the Engineer to verify that any complete portion of work is as specified and acceptable for service.

3.03 HIGHWAYS, STREET AND PUBLIC PROPERTY

A. The Contractor shall fully adhere to the State Highway Department Encroachment Permit while operating in any state right-of-way and all construction techniques shall comply with the current edition of the State Highway Department Standard Specifications and Traffic Control Manual.

B. There shall be no physical connection between a public water supply system and a sewer system. No potable water main shall pass through or come in contact with any part of a sewer manhole.

C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water main then:

1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water main, or:

2. Sewer will be laid in the same trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or:

3. If conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

D. When conditions require a sewer line to cross over a water main, both the water main and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

E. Water/sewer line separation shall be in accordance with Section R61.58.4D(12) of the State Primary Drinking Water Regulations.

F. When it is not possible to maintain the separation distances specified in the regulation above, the Engineer may allow an alternative design subject to approval from SC DES. The alternative design shall:

1. Maximize the distance between the water main and sewer line and the joints of each.

2. Use materials that meet the state regulatory requirement (R61.58.4) and

3. Allow adequate distance for maintenance and repairs on each line without causing damage to the other line.

3.04 CROSS CONNECTION CONTROL (BACKFLOW PREVENTION DEVICES)

A. No water service connection shall be installed or maintained unless the water supply is protected from contamination as required by state and local regulation.

B. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks where non-potable water or other contaminates may be discharged or drawn into the system.

C. Bypassing a backflow prevention device shall not be allowed unless the bypass is also equipped with an equal, approved backflow prevention device.

D. High hazard category, as determined by the Engineer, shall require an air gap separation or an approved reduced pressure principle backflow device.

E. Reduced pressure principle devices shall be required in any area subject to flooding or water backup.

F. All piping to the inlet of the backflow prevention device shall be suitable for potable water and shall be AWWA and/or NSF approved. Black steel shall not be allowed.

G. Fire line sprinkler systems and dedicated fire lines shall be protected by an approved double check valve assembly device, unless the fire line/sprinkler system serves a high hazard category.

3.05 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.

B. Remove large stones or other hard matter that could damage tile or impede consistent backfilling or compaction.

3.06 INSTALLATION - PIPE

A. All pipe and fittings shall be protected during handling against impact shocks and free fall. Pipe and fittings shall be cleaned before they are laid and shall be always kept clean.

B. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged or unsound pipe shall be rejected.

C. If any defective piece is discovered after having been laid, it shall be removed and replaced with a sound one at the Contractor's expense.

D. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint.

E. The procedure in making up the pipe joints shall be performed in accordance with the recommendations of the manufacturer. All accessories used in making the joints shall be obtained from the manufacturer of the pipe.

F. Pipe ends shall not be left open at the end of the day's work or during temporary suspension of construction but shall be securely covered to prevent the entry of any water, earth or foreign matter.

G. Kinks or sharp bends giving excessive deflection or which put pipe joints in strain will not be permitted.

H. When cutting short lengths of pipe, a pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe. In the case of "push-on" pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

I. Where the use of nuts, bolts, washers, rods, straps and clamps are required due to the peculiarities of the installation, these items shall be installed and be of the size and dimension as shown on the drawings. After installation, and before backfilling, all the above items shall be painted with bituminous paint or coal tar enamel. In lieu of the above, accessories and fittings shall be provided using stainless steel or other non-corrosive metals.

J. Any pipe, fitting or accessory not meeting the specified AWWA/ ASTM Standard shall not be used.

K. Install pipe, fittings and accessories in accordance with AWWA C600, ASTM D 2774, SECTION C AWWA Standards and manufacturer's instructions. Seal joints watertight.

L. Place pipe on approved bedding in accordance with the drawings and specifications.

M. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.

3.07 INSTALLATION • VALVES

A. Install gate valves in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix to AWWA C500.

B. Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.

C. Bottom of hydrant must be restrained by use of tie-rods to adjacent fittings, concrete blocking, or other method approved by the Engineer.

D. Install hydrants with the 4 1/2" pumper outlet facing the nearest paved surface. If there is any question as to the direction the hydrant should face, contact the Owner or the Engineer.

E. The base of hydrant must be backfilled with #2 stone washed of fines, or equivalent, to allow the drain holes adequate drainage.

3.08 INSPECTION

A. All work done and materials furnished shall be subject to the inspection of the Engineer and his Inspector. The Engineer reserves the right to mark rejected materials to distinguish them as such.

B. All improper work shall be reconstructed at the Contractor's expense.

C. All materials that do not conform to the requirements of the specifications shall be removed and replaced with approved materials at the Contractor's expense.

3.09 MECHANICAL RESTRAINTS

A. Lines shall have restrained joints at all tees, bends, crosses, valves and hydrants, or as directed by the Engineer.

B. Acceptable methods for joint restraint shall be the use of metal tie-rods or EBAA Iron Inc., MEGALUG or equivalent.

C. Retainers for pipe bells shall be required with the use of the MEGALUG restraints.

D. Concrete blocking shall not be used.

3.10 TESTING AND LEAKAGE

A. Each completed section of the pipeline shall pass pressure and leakage testing in accordance with AWWA C600.

B. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the water main is being filled for the hydrostatic pressure test, all air shall be expelled from the pipe through blow-offs or temporary taps.

C. The water main shall be subjected to a hydrostatic pressure of 1.5 times the maximum working pressure at the point of testing for a minimum period of two hours. The minimum test pressure shall be 150 psi unless otherwise specified on the plans, SC DES permit, or elsewhere in these specifications.

D. The leakage during the test shall not be more than calculated using the following formula and in accordance with AWWA C600.

E. The required hydrostatic pressure shall be applied to the water line by means of a hand pump for small lines or using a gasoline pump or fire engine for larger lines.

F. During the test the lines shall be thoroughly examined for leakage at the joints and fixed where applicable. All visible leakage shall be repaired regardless of the amount.

G. Any cracked or defective pipes, fittings or valves discovered as a consequence of the pressure test shall be removed and replaced by the Contractor at his own expense. The water line is to be retested at the required pressure for two hours.

H. Where pipeline construction ties into existing lines, and where it is not practicable to make a hydrostatic pressure test, the Contractor shall leave this section of pipeline uncovered at each applicable joint for inspection for a period of 48 hours after the connection has been made and the line is placed in service. The Contractor shall make the necessary restraints to make sure that the water line does not blow apart at these uncovered joints. The Contractor shall immediately correct any leakage discovered in these joints.

I. The Engineer or his designee shall witness all pressure tests. The Contractor is to notify the Engineer a minimum of 24 hours prior to the pressure test.

J. The allowable leakage shall be calculated using the following formula:

$$L \text{ (for DIP)} = \frac{SD(P)^{1/2}}{133{,}200} \qquad \text{or} \qquad L \text{ (for PVC)} = \frac{ND(P)^{1/2}}{7{,}400}$$

Where L = Allowable Leakage (gallons per hour)
S = Length of pipe being tested (feet)
D = Diameter of the pipe (inches)
P = Average Test pressure (psi)
N = Number of Joints being tested

Test shall last for a period of 2 hours

3.11 DISINFECTION

A. The entire water distribution system shall be disinfected in accordance with AWWA C651, current version.

B. The entire water distribution system shall be flushed thoroughly before chlorination begins to remove algae, deposits and other foreign substances.

C. Using the "continuous fee method", fill all new piping and any existing piping affected by the Contractor's operations with a chlorine solution containing a free chlorine residual of at least 50 ppm. Water from the existing distribution system shall be controlled to slowly fill all of the new pipe system during the application of chlorine. After the chlorine has been applied to the water in the system, the system shall be isolated, and the chlorinated water shall remain in the lines for twenty-four (24) hours. At the end of this period, the treated water in all portions of the main must have free chlorine residual of not less than 10 ppm. Flush all chlorine out of the system with potable water of satisfactory bacteriological quality prior to beginning sampling. Prior to sampling, the chlorine residual shall be reduced to normal system residual levels.

D. Water samples shall be collected from various points along the main. A minimum of two samples shall be taken at each sampling point for total coliform analysis. The number of sample points is dependent on the system layout but shall include all dead-end lines, shall be representative of the water in the new mains, and shall be a minimum of one sample point every 1,200 linear feet and at least two sample points shall be required for all new mains. Two consecutive satisfactory bacteriological test taken 24 hours apart must show the water line to absent of total coliform bacteria and the chlorine residual shall be measured and reported for each sample. If the membrane filter method of analysis is used for coliform analysis, non-coliform growth shall be reported. In non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and shall be repeated. The required tests shall be conducted by a state certified laboratory and paid for by the Contractor. Copies of all test results shall be furnished to the engineer promptly after the laboratory makes the results known.

3.12 CLEANUP AND MAINTENANCE

A. Cleanup shall follow immediately behind the pipe laying and backfilling operations. The Contractor shall maintain a clean orderly construction site.

3.13 FIELD QUALITY CONTROL

A. The Engineer or his designee shall conduct routine field inspections and a final project inspection.

3.14 PROTECTION

A. Protect pipe from damage or displacement until backfilling is in progress.

END OF SECTION

This page intentionally left blank

DIVISION 33 30 00 SANITARY SEWER AND GRAVITY SYSTEMS

Part 1 - General

1.00 SECTION INCLUDES

A. Gravity Sewer piping, fittings, and accessories
B. Connection of building sanitary sewer system to municipal sewers
C. Manholes, cleanouts and accessories

1.01 REFERENCES:

The standards listed below are included in this specification by reference. Specifications cited shall refer to the latest standards revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.

A. AWWA C150 - Thickness Design of Ductile-Iron Pipe
B. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand- Lined Molds, for Water or other Liquids
C. AWWA C104 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water
D. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings
E. AWWA C110 - Ductile-Iron Fittings and Grey-Iron Fittings, 3 in. through 48 in., for Water and other Liquids
F. ASTM D 1719 (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
G. ASTM D 3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
H. ASTM D 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
I. UNI-B-3-88 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe
J. UNI-B-6-90 - Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
K. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
L. ASTM A 48 - Gray Iron Castings
M. ASTM C 478 - Pre-cast Reinforced Concrete Manhole Sections

1.02 REGULATORY REQUIREMENTS

A. Conform to all applicable South Carolina Department of Environmental Services (SC DES) regulations for materials and installation for sanitary sewer construction

1.03 SUBMITTALS

A. Submit product data in accordance with general requirements for pipe, pipe accessories, manholes, manhole accessories, cleanouts and cleanout accessories, for approval prior to construction.

Part 2 - Products

2.01 MANUFACTURERS

A. Pipe

1. US Pipe
2. American Cast Iron Pipe Company
3. Griffin Pipe Products Company
4. McWane Cast Iron Pipe
5. JM Eagle
6. Vulcan Materials

B. Manholes

1. Vulcan Materials
2. Taylor Concrete Products
3. Knight's Precast
4. Jensen Precast
5. Tindall Corporation

C. Manhole Frame and Cover

1. EJ Group, Inc.
2. U.S. Foundry

D. Miscellaneous Accessories

1. PSI Products - Thunderline - Link Seals
2. M.A. Industries

2.02 GENERAL

A. The engineer will not permit intermixing of different types of pipe unless specified on the drawings or by approved written permission. If approved, pipe type changes shall occur only at manholes.

B. All pipe shall be of first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length.

C. All pipe shall be subject to the inspection of the engineer at the pipe plant, trench, or point of delivery, for purpose or culling and rejecting pipe (independent of laboratory test), which does not conform to the requirements of these specifications. The Engineer shall mark such pipe, and the Contractor shall remove it from the project site upon notice being received of its rejection.

D. Ductile Iron Pipe shall be used at depths of 14 feet and deeper, as directed by the Engineer or as shown on the drawings.

2.03 GRAVITY SEWER PIPE MATERIALS

A. Ductile Iron Pipe: AWAA C150 &. AWWA C151, Pressure Class 350, "Protecto 401" Ceramic Expoxy Lined Pipe or "Sewpercoat" Lined Pipe; inside nominal diameter as shown on drawings. Joints shall be push on unless otherwise shown on the drawings.

1. Ductile Iron Pipe Joint Device: AWA C111 rubber gasket joint device.

B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D3033 &. ASTM D3034, SDR 35, Type PSM, Polyvinyl Chloride (PVC) material; inside nominal diameter as shown. Bell and spigot style. Install in accordance with ASTM D2321. Laying length shall be 13 feet ± 1 foot.

1. Polyvinyl Chloride (PVC) Fittings: ASTM D 3034 with minimum wall thickness of SDR35. Fittings in sizes through 8" shall be molded in one piece with elastomeric joints and minimum socket depths as specified in sections 6.2 and 7.3.2. Fittings 10" and larger shall be molded or fabricated in accordance with section 7.11 with manufacturer's standard pipe bells and gaskets.

2. Gaskets shall have a minimum cross-sectional area of 0.20 sq. in. and conform to ASTM F 477.

3. PVC material shall have a cell classification of 12454-B or C as defined in ASTM D 1784.

C. Alternate Pipe Materials - Pipe that is not specified herein such as ABS, Vitrified Clay, CIP, etc., shall not be installed unless otherwise shown on the Plans, approved by the Engineer and approved within the SC DES construction permit.

2.04 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps, and other configurations required unless otherwise shown on drawings. Ductile iron fittings shall be lined to meet pipe material lining specifications.

B. All services or lateral lines shall be connected to mainline sewers with in-line service wyes only. Saddle wyes are not acceptable on new construction.

C. Link Seal - Wall seals for all pipe entering pump stations shall be installed in accordance with the manufacturer's installation instructions. All link seals shall be grouted in place after pipe placement.

2.05 MANHOLES

A. Manholes shall be pre-cast.

B. Frame and Cover: Iron casting confirming to ASTM A48, Class 30C iron. Minimum manhole cover diameter shall be 24 inches, and the manhole ring and cover assembly shall not weigh less than 300 pounds. For elevations above the 50-year flood level, frames and covers shall be Sumter Machinery Company, MF-6, MC-2 or equivalent. For elevations below the 50-year flood level, frames and covers shall be watertight Sumter machinery MF-50GT, MC- 50GT or equivalent.

C. Shaft Construction and Eccentric Cone Top Section: Reinforced pre-cast or cast-in-place concrete pipe sections, lipped male-female, "O" ring gasket type joints; cast steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter of 48, 60, 72, 96 inches as shown on the drawings.

D. Drop Manholes and Drop Connections shall be required where the invert differential is 24-inches or greater and shall be installed as shown on the Plans and standard detail drawings, or as directed by the Engineer.

E. Manhole Steps: Neoprene coated steel steps cast or driven into manhole wall, 11 inches square and projecting from the wall 6 inches. Steps are to be a maximum of 16 inches on center.

F. Rubber Boots: All manholes to be equipped with rubber boots and all stainless-steel bands at each pipe portal.

G. Coatings: Manhole coating shall consist of 21 mils, Kop-Coat 300-M Coal Tar Epoxy applied to the interior vertical surfaces as recommended by the manufacturer. Manhole coating shall be as shown on the plans or as specified elsewhere herein.

2.06 FILL MATERIAL

A. Ductile Iron Pipe: Acceptable native materials.

B. Polyvinyl Chloride (PVC) Plastic Pipe: Bed in accordance with bedding detail on drawings.

Part 2 - Execution

3.01 GENERAL

A. The Contractor shall furnish all material and labor, and construct the gravity sewers shown on the drawings, including all clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and other appurtenances.

B. The work shall include all ditching, pumping, bailing, draining, flushing, testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables, and other structures.

C. The Contractor shall be responsible for the cleaning away of all rubbish and surplus materials upon completion of the work required to build and put in complete working order the specified sewer and all structures appertaining thereto.

D. All sewers and appurtenances shall be cleared of all foreign debris.

3.02 ORDER OF WORK

A. The Owner reserves the right to direct the Contractor as to which portions of the work should be constructed first, and upon order of the Engineer, to verify that any complete portion of work is as specified and acceptable for service.

3.03 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

A. The Contractor shall fully adhere to the SCDOT Permit while operating in any state right-of-way and all construction techniques shall comply with the current editions of the SCDOT Standard Specifications for Highway Construction and Work Zone Traffic Control Manual, and Manual on Uniform Traffic Control Devices (MUTCD).

B. Through traffic shall be maintained at all times during construction of sewer across all streets and highways. If the open cut method is used, two separate cuts must be made, and one lane of traffic must be open at all times.

C. The Contractor shall obtain, by agreement with the property owner, any additional space required for construction on private property.

3.04 EXISTING UTILITIES AND STRUCTURES

A. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.

B. The approximate position of certain known underground lines is shown on the drawings for information only.

C. The Contractor shall be responsible for having all underground utilities located by the appropriate party. Seventy-two (72) hours advance notice is required for utility locations.

3.05 POTABLE WATER PROTECTION (SEPARATION OF WATER AND SEWER LINES)

A. Adequate provision shall be made for the protection of potable water supplies from possible leakage from sewers located near water lines.

B. There shall be no physical connection between a public water supply system and a sewer system. No potable water main shall pass through or come into contact with any part of a sewer manhole.

C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water main then:

1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water main, or:

2. Sewer will be laid in the same trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or:

3. If conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

D. When conditions require a sewer line to cross over a water main, both the water and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

E. Water /sewer line separation shall be in accordance with Section R61.58.4D(12) of the State Primary Drinking Water Regulations.

F. When it is not possible to maintain the separation distances specified in the regulation above, the Engineer may allow an alternative design subject to approval from SC DES. The alternative design shall: 1. Maximize the distance between the water main and sewer line and the joints of each. 2. Use materials that meet the state regulatory requirement (R61.58.4) and 3. Allow adequate distance for maintenance and repairs on each line without causing damage to the other line.

3.06 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.

B. Remove large stones or other hard matter, which could damage the pipe or impede consistent backfilling or compaction.

3.07 INSTALLATION – PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321, and manufacturer's instructions. All sewer lines shall be installed with a minimum of 3-feet cover over the pipe unless otherwise shown on the plans and approved in the SC DES construction permit.

B. Pipe shall be protected during handling against impact shocks and free fall.

C. Lay pipe to slope gradient noted on drawings. Pipe laying shall begin at the lowest grade point with spigot ends pointing down grade and forming a uniform invert.

D. All surfaces of pipe to be jointed, as well as the rubber gaskets, shall be cleaned and lubricated with a vegetable soap or other lubricating agent as per the manufacturer's recommendations. Seal joints watertight.

E. Pipe shall not be placed on blocking at any time unless approved by the Engineer, and then only at manholes or other structures where temporary blocking may facilitate installation of the pipe. After the pipe has been installed, all blocking shall be removed and all voids filled with select material and compacted in place.

F. All end line pipes, temporary or permanent, shall be fully protected with a watertight stopper to prevent water, earth, or other foreign debris from entering the pipe.

G. Pipe of different material shall not be joined together unless directly specified by the Engineer. Changes in pipe material shall be made at manholes only.

3.08 INSTALLATION – MANHOLES

A. Minimum diameter of manholes shall be 4'-0" (48") and pre-cast manholes shall conform to all the requirements of ASTM C478.

B. Form bottom of excavation clean and smooth to correct elevation. Establish elevations and pipe inverts for inlets and outlets as indicated.

C. All invert channels shall be smooth and semi-circular in shape, conforming to the inside of the adjacent sewer pipe section. Changes in direction of flow shall be made with a smooth curve, as large in radius as the size of the manhole will allow. Changes in the size and grade of the channels shall be formed directly in the concrete of the manhole base. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot nor more than two inches per foot.

D. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer.

E. Mount lid and frame level in grout, secured to top cone section at elevation indicated.

3.09 SEWER SERVICES AND CLEANOUTS

A. All services shall have a watertight plug or cap at the end of the pipe.

B. Services, unless otherwise directed, shall extend from the main sewer line to the property line or street right-of-way. Install cleanouts as shown on the drawings.

C. The end of the service shall be marked with a pressure treated post marker (4"X4") or a PVC marker (painted pine markers are not acceptable). All pressure treated markers shall be painted with an exterior weatherproof paint, green in color. The marker shall extend 6" above ground and not less than 3 feet below ground. It shall be placed exactly 3 feet further than the end of the service and on a line perpendicular to the centerline of the main. If the 3 feet cannot be obtained due to obstructions, the marker shall be set within 3 feet of the service end location.

D. All services and cleanouts shall be a minimum of 6 inches in diameter, unless otherwise directed.

E. Services and cleanouts shall be of the same material as the main line sewer unless shown otherwise.

F. Cleanouts located in asphalt or concrete pavement shall be protected by a frame and cover as manufactured by Vulcan Foundry, Inc., catalog number V- 8503 or equivalent.

3.10 INSPECTION

A. All work done and materials furnished shall be subject to the inspection of the Engineer and his inspector. The Engineer reserves the right to mark rejected materials to distinguish them as such.

B. All improper work shall be reconstructed at the Contractor's expense.

C. All materials which do not conform to the requirements of the specifications, shall be removed and replaced with approved materials at the Contractor's expense.

3.11 PIPE TESTING

A. Mandrel:

1. A mandrel shall be pulled through PVC line sections at any time prior to or during the one-year warranty period. A 5% mandrel shall be used on any line which has been installed for less than thirty days. After 30 days a 7 1/2% mandrel will be allowed.

2. An approved mandrel, proving ring, pulling ropes and cables shall be provided by the Contractor for testing PVC pipe at no additional cost to the Owner.

3. The mandrel shall be hand-pulled through the pipe using no wrenched or other mechanical devices except a pulley at the manhole invert. The pulley allows the mandrel to be pulled from ground level rather than from inside the manhole.

4. If, at any point in the pipe in question, one (1) man is unable to hand pull the mandrel through the pipe, then the pipe will be deemed unacceptable. The failed pipe shall be re-excavated, and the problem solved at the Contractor's expense.

5. Infiltration/Exfiltration Testing:

6. Measurements of infiltration/exfiltration will be made before sewage flows are allowed in the sewers.

7. Measurements for infiltration shall be made using a V-notch weir or by measuring the volume directly. Measurements for exfiltration shall be made by bulk heading the sewer at the end of the lower grade, partially filling the manhole at the upper end and computing the volume of leakage from the extent of the diminished volume of water in the manhole during the test period. (This method is only applicable for dry soil conditions).

8. All infiltration/exfiltration tests shall be conducted by the Contractor in the presence of the Engineer.

9. All testing shall be at the expense of the Contractor.

10. Allowable limit of exfiltration and ground water infiltration for the en tire system of new sewer or any one trunk, interceptor or outfall sewer line, including connecting laterals, shall not exceed 100 gallons per day per inch of pipe diameter per mile of pipe. This rate will be applied to any length of pipe in order to isolate excessive infiltration/exfiltration areas.

11. Low Pressure Air Testing of Gravity Sewers:

12. Air testing may be performed in lieu of infiltration/exfiltration testing as approved by the Engineer. All testing shall conform to ASTM F1417.

3.12 FIELD QUALITY CONTROL

A. Field inspection will be performed by the Engineer and/or Owner.

B. Materials testing (i.e., compaction, concrete strength, etc.) shall be performed as directed by the Engineer.

3.13 PROTECTION

A. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION

This page intentionally left blank