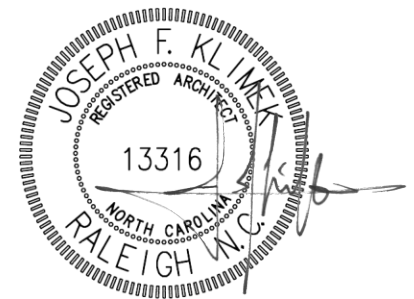


Project Manual

New Judicial Center & Annex Renovations for Franklin County West Nash Street Louisburg, NC 27549

PRE-BID DATE: September 10, 2025
PRE-BID TIME: 2:00 PM
PRE-BID LOCATION: Franklin County Administration Building
113 Market Street
Louisburg, NC 27549

BID DATE: September 30, 2025
BID TIME: 2:00 PM
BID LOCATION: Franklin County Administration Building
113 Market Street
Louisburg, NC 27549



BID SET

September 2025

Architect's Project Number: 21054

Oakley Collier Architects, PA
109 Candlewood Road
Rocky Mount, North Carolina 27804
205 West Martin Street
Raleigh, North Carolina 27601



This page intentionally left blank

TABLE OF CONTENTS

- Table of Contents
- Project Personnel
- Notice to Bidders
- Instructions to Bidders (AIA A701-2018)
- Supplementary Instructions to Bidders
- General Conditions (AIA A201-2017)
- Supplemental General Conditions
- Geotechnical Report
- Hazardous Materials Report
- Structural Observation Report
- Structural Testing Scope
- Form of Proposal
- Minority Business Participation Forms
- Form of Bid Bond (AIA A310-2010)
- Construction Agreement (AIA A101-2017)
- Form of Performance Bond (AIA A312-2010)
- Form of Payment Bond (AIA A312-2010)
- Certificate of Substantial Completion (AIA G704-2017)
- Index of Drawings

DIVISION 1 – GENERAL REQUIREMENTS

- 01 10 00 - Summary
- 01 20 00 - Price and Payment Procedures
- 01 21 00 – Allowances
- 01 22 00 – Unit Prices
- 01 23 00 – Alternates
- 01 25 00 – Substitution Procedures
- 01 30 00 - Administrative Requirements
- 01 32 16 - Construction Progress Schedule
- 01 33 00 - Submittal Procedures
- 01 40 00 - Quality Requirements
- 01 41 00 – Structural Testing Laboratory Services
- 01 50 00 - Temporary Facilities and Controls
- 01 51 00 - Temporary Utilities
- 01 52 13 – Field Offices and Sheds
- 01 57 13 – Temporary Erosion and Sediment Control
- 01 58 13 - Temporary Project Signage
- 01 60 00 - Product Requirements
- 01 70 00 - Execution and Closeout Requirements
- 01 74 19 - Construction Waste Management and Disposal

01 78 00 - Closeout Submittals

01 79 00 – Demonstration and Training

DIVISION 2 – EXISTING CONDITIONS

02 41 00 – Demolition

DIVISION 3 – CONCRETE

03 15 00 – Concrete Accessories

03 20 00 – Mild Reinforcing for Concrete

03 30 00 – Cast-In-Place Concrete

03 30 05 – MVRA for Cast-In-Place Concrete

03 45 00 – Precast Architectural Concrete

03 49 00 – Glass-Fiber Reinforced Concrete

DIVISION 4 – MASONRY

04 05 11 – Masonry Mortaring and Grouting

04 20 00 – Unit Masonry

04 22 00 – Concrete Unit Masonry

DIVISION 5 – METALS

05 12 00 – Structural Steel Framing

05 21 00 – Steel Joist Framing

05 31 00 – Steel Decking

05 40 00 – Cold-Formed Metal Framing

05 50 00 – Metal Fabrications

05 51 00 – Metal Stairs

05 51 33 – Metal Ladders

05 52 13 – Pipe and Tube Railing

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

06 10 00 – Rough Carpentry

06 10 01 – Rough Carpentry

06 16 00 – Sheathing

06 20 00 – Finish Carpentry

06 41 00 – Architectural Wood Casework

06 65 10 – Solid Surface Fabrications

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07 11 13 – Bituminous Dampproofing

07 13 00 – Sheet Waterproofing

07 21 00 – Thermal Insulation
07 24 00 – Exterior Insulation and Finish Systems
07 26 00 – Underslab Vapor Retarder
07 27 26 – Fluid-Applied Membrane Air Barriers
07 54 00 – Thermoplastic Membrane Roofing
07 62 00 – Sheet Metal Flashing and Trim
07 65 23 – EPDM Through-Wall Flashing
07 71 00 – Roof Specialties
07 72 00 – Roof Accessories
07 84 00 – Firestopping
07 91 00 – Preformed Joint Sealants
07 92 00 – Joint Sealants
07 95 13 – Expansion Joint Cover Assemblies

DIVISION 8 – OPENINGS

08 11 13 – Hollow Metal Doors and Frames
08 14 16 – Flush Wood Doors
08 31 00 – Access Doors and Panels
08 33 23 – Overhead Coiling Doors
08 34 61 – Bullet Resistant Wood Doors
08 34 63 – Detention Doors and Frames
08 43 13 – Aluminum-Framed Entrances and Storefronts
08 43 33 – Bullet Resistant Aluminum-Framing System
08 56 53 – Security Windows
08 71 00 – Door Hardware
08 80 00 – Glazing
08 88 00 – Special Function Glazing
08 88 13 – Fire-Rated Glazing

DIVISION 9 – FINISHES

09 05 61 – Common Work Results for Flooring Preparation
09 21 16 – Gypsum Board Assemblies
09 22 16 – Non-Structural Metal Framing
09 22 40 – Security Mesh
09 24 00 – Cement Plastering
09 30 00 – Tiling
09 51 00 – Acoustical Ceilings
09 66 23 – Resinous Matrix Terrazzo Flooring
09 67 00 – Fluid-Applied Flooring

09 68 13 – Tile Carpeting
09 69 33 – Low-Profile Fixed Height Access Flooring
09 70 00 – Aluminum Millwork Trim
09 81 00 – Acoustic Insulation
09 84 30 – Sound-Absorbing Wall and Ceiling Units
09 91 13 – Exterior Painting
09 91 23 – Interior Painting
09 93 00 – Staining and Transparent Finishing

DIVISION 10 – SPECIALTIES

10 14 00 – Signage
10 14 16 – Plaques
10 14 19 – Dimensional Letter Signage
10 21 13.17 – Phenolic Toilet Compartments
10 22 13 – Wire Mesh Partitions
10 26 41 – Ballistic Resistant Panels
10 28 00 – Toilet, Bath, and Laundry Accessories
10 44 00 – Fire Protection Specialties
10 75 00 – Flagpoles
10 82 13 – Exterior Grilles and Screens

DIVISION 11 – EQUIPMENT

Not Used

DIVISION 12 – FURNISHINGS

12 21 13 – Horizontal Louver Blinds
12 24 00 – Window Shades
12 36 00 – Countertops
12 55 00 – Detention Furnishings and Accessories
12 67 00 – Pews and Benches

DIVISION 13 – SPECIAL CONSTRUCTION

Not Used

DIVISION 14 – CONVEYING EQUIPMENT

14 21 00 – Electric Traction Elevators

DIVISION 21 – FIRE SUPPRESSION

21 05 00 – General Fire Sprinkler Requirements
21 05 13 – Electrical Work in Sprinkler Contract

21 05 23 – Fire Sprinkler System Piping

21 05 29 – Pipe Supports

DIVISION 22 –PLUMBING

22 05 00 – Basic Plumbing Requirements

22 05 03 – Through Penetration Firestopping

22 05 29 – Plumbing Supports and Anchors

22 05 50 – Seismic Requirements for Equipment and Supports

22 05 53 – Plumbing Identification

22 07 19 – Plumbing Piping Insulation

22 10 00 – Plumbing Piping

22 10 30 – Plumbing Specialties

22 11 33 – Domestic Water Pumps

22 14 29 – Sump Pumps

22 30 00 – Plumbing Equipment

22 40 00 – Plumbing Fixtures

DIVISION 23 –MECHANICAL

23 05 00 – Common Work Results for HVAC

23 05 13 – Electrical Work (Mechanical)

23 05 29 – Mechanical Hangers and Supports

23 05 48 – Vibration Isolation

23 05 53 – Identification of HVAC Components

23 05 93 – Testing and Balancing

23 07 00 – Insulation

23 08 00 – Mechanical Commissioning Requirements

23 09 00 – Building Automation System Requirements

23 29 23 – Variable Frequency Drives

23 31 00 – Ductwork

23 33 13 – Fire Dampers

23 34 00 – Fans

23 36 00 – Air Terminal Units

23 37 00 – Air Distribution

23 81 13 – Outdoor Packaged Unit

23 81 43 – Split System Heat Pump

23 82 39 – Electric Resistance Heating Unit

DIVISION 26 –ELECTRICAL

26 00 00 – General Provisions (Electrical) Contract
26 05 20 – Wires and Cables
26 05 33 – Boxes and Cabinets
26 05 45 – Conduit and Conduit Fittings
26 05 53 – Electrical Identification
26 08 00 – Electrical Commissioning Requirements
26 22 13 – Dry Type Transformers
26 24 13 – Service Entrance Switchboard
26 24 16 – Panel Boards and Circuit Breakers
26 27 26 – Wiring Devices
26 27 27 – Disconnects
26 32 13 – Spark Ignited Engine-Driven Generator Sets
26 33 05 – Battery Emergency Supply (EI1)
26 36 23 – Automatic Transfer Switches (ATS)
26 51 00 – Lighting Fixtures

DIVISION 27 – COMMUNICATIONS

27 10 00 – Telecommunication Distribution System

DIVISION 28 –ELECTRONIC SAFETY AND SECURITY

28 00 00 – Security Control System
28 00 10 – Programmable Logic Control System
28 00 20 – Control Stations
28 20 00 – IP Video Management System
28 30 00 – Access Control System
28 31 00 – Addressable Fire Alarm System
28 50 00 – Auxiliary Control System
28 50 00 – Bi-Directional Antenna System (BDA)
28 55 00 – RF Survey for Emergency Responder Radio Antenna/Repeater System (ERRRS)
28 90 00 – Security Management Server

DIVISION 31 – EARTHWORK

31 31 16 – Termite Control

DIVISION 32 –EXTERIOR IMPROVEMENTS

31 31 16 – Termite
32 31 36 – Security Gate and Barriers
32 35 00 – Screening Devices

DIVISION 33 – UTILITIES

Not Used

END OF TABLE OF CONTENTS

This page intentionally left blank

PROJECT PERSONNEL

PROJECT: New Judicial Center & Annex Renovations for
Franklin County
Louisburg, NC 27549

PROJECT NO: 21054

DATE: August 2025

OWNER: Franklin County
113 Market Street
Louisburg, NC 27549

ARCHITECT: Oakley Collier Architects, P.A.
109 Candlewood Road
Rocky Mount, NC 27804
252-937-2500

CIVIL ENGINEER: The Wooten Company
120 N. Boylan Avenue
Raleigh, NC 27603
(919)828-0531

STRUCTURAL ENGINEER: Ellinwood + Machado
4208 Six Forks Rd, STE 830
Raleigh, NC 27609
(919)322-5550

PLUMBING ENGINEER: Atlantec Engineers, PA | IMEG
3221 Blue Ridge Road / Suite 113
Raleigh, NC 27612
(919)571-1111

MECHANICAL ENGINEER: Atlantec Engineers, PA | IMEG
3221 Blue Ridge Road / Suite 113
Raleigh, NC 27612
(919)571-1111

ELECTRICAL ENGINEER: Atlantec Engineers, PA | IMEG
3221 Blue Ridge Road / Suite 113
Raleigh, NC 27612
(919)571-1111

FIRE PROTECTION ENGINEER: Atlantec Engineers, PA | IMEG
3221 Blue Ridge Road / Suite 113
Raleigh, NC 27612
(919)571-1111

CERTIFICATION OF TECHNICAL SPECIFICATIONS

The following Technical Specifications found in this project manual were prepared by the Design Professional whose name and stamp appear below.

Specification Section Specification Title

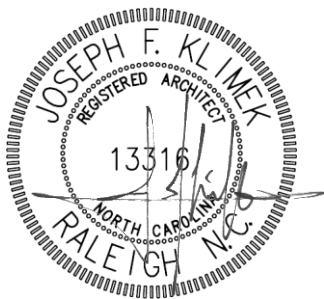
Full Name

Discipline

Seal

Joseph F. Klimek
Oakley Collier Architects
Firm License # 50681

Architect



CERTIFICATION OF TECHNICAL SPECIFICATIONS

The following Technical Specifications found in this project manual were prepared by the Design Professional whose name and stamp appear below.

<u>Specification Section</u>	<u>Specification Title</u>
21 05 00	General Fire Sprinkler Requirements
21 05 13	Electrical Work in Sprinkler Contract
21 05 23	Fire Sprinkler System Piping
21 05 29	Pipe Supports

Full Name

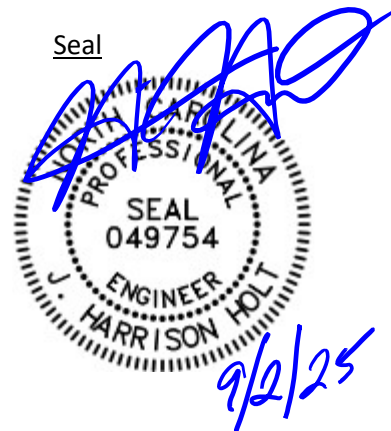
IMEG Corp.
Firm License F-1507

J. Harrison Holt, PE
PE License #049754
3221 Blue Ridge Rd. Suite 113
Raleigh, NC 27612
Phone: 919-571-1111
E-mail:
harrison.holt@imegcorp.com

Discipline

Fire Protection Engineer

Seal



CERTIFICATION OF TECHNICAL SPECIFICATIONS

The following Technical Specifications found in this project manual were prepared by the Design Professional whose name and stamp appear below.

<u>Specification Section</u>	<u>Specification Title</u>
22 05 00	Basic Plumbing Requirements
22 05 03	Through Penetration Firestopping
22 05 29	Plumbing Supports and Anchors
22 05 50	Seismic Requirements for Equipment and Supports
22 05 53	Plumbing Identification
22 07 19	Plumbing Piping Insulation
22 10 00	Plumbing Piping
22 10 30	Plumbing Specialties
22 11 33	Domestic Water Pumps
22 14 29	Sump Pumps
22 30 00	Plumbing Equipment
22 40 00	Plumbing Fixtures

Full Name

IMEG Corp.
Firm License F-1507

Discipline

Plumbing Engineer

Seal



J. Harrison Holt, PE
PE License #049754
3221 Blue Ridge Rd. Suite 113
Raleigh, NC 27612
Phone: 919-571-1111
E-mail: harrison.holt@imegcorp.com

CERTIFICATION OF TECHNICAL SPECIFICATIONS

The following Technical Specifications found in this project manual were prepared by the Design Professional whose name and stamp appear below.

<u>Specification Section</u>	<u>Specification Title</u>
23 05 00	Common Work Results for HVAC
23 05 13	Electrical Work (Mechanical)
23 05 29	Mechanical Hangers and Supports
23 05 48	Vibration Isolation
23 05 53	Identification of HVAC Components
23 05 93	Testing and Balancing
23 07 00	Insulation
23 08 00	Mechanical Commissioning Requirements
23 09 00	Building Automation System Requirements
23 29 23	Variable Frequency Drives
23 31 00	Ductwork
23 33 13	Fire Dampers
23 34 00	Fans
23 36 00	Air Terminal Units
23 37 00	Air Distribution
23 81 13	Outdoor Packaged Unit
23 81 43	Split System Heat Pump
23 82 39	Electric Resistance Heating Unit

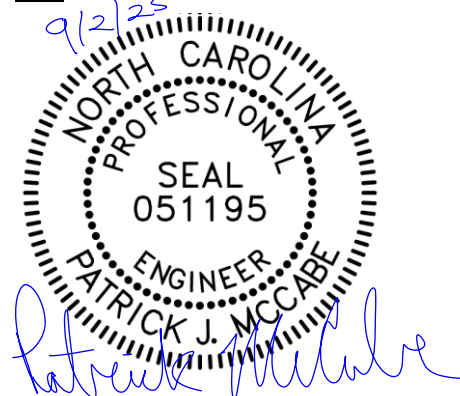
Full Name

IMEG Corp.
Firm License F-1507

Discipline

Mechanical Engineer

Seal



Patrick McCabe, PE
PE License #051195
3221 Blue Ridge Rd. Suite 113
Raleigh, NC 27612
Phone: 919-571-1111
E-mail:

patrick.j.mccabe@imegcorp.com

Section 26 00 00, 27 00 00, & 28 00 00
CERTIFICATION OF TECHNICAL SPECIFICATIONS

The following Technical Specifications found in this project manual were prepared by the Design Professional whose name and stamp appear below.

<u>Specification Section</u>	<u>Specification Title</u>
26 00 00	GENERAL PROVISIONS (ELECTRICAL) CONTRACT
26 05 20	WIRES AND CABLES
26 05 33	BOXES AND CABINETS
26 05 45	CONDUIT AND CONDUIT FITTINGS
26 05 53	ELECTRICAL IDENTIFICATION
26 08 00	ELECTRICAL COMMISSIONING REQUIREMENTS
26 22 13	DRY TYPE TRANSFORMERS
26 24 13	SERVICE ENTRANCE SWITCHBOARD
26 24 16	PANEL BOARDS AND CIRCUIT BREAKERS
26 27 26	WIRING DEVICES
26 27 27	DISCONNECTS
26 32 13	SPARK IGNITED ENGINE-DRIVEN GENERATOR SETS
26 33 05	BATTERY EMERGENCY POWER SUPPLY (EI1)
26 36 23	AUTOMATIC TRANSFER SWITCHES (ATS)
26 51 00	LIGHTING FIXTURES
27 10 00	TELECOMMUNICATION DISTRIBUTION SYSTEM
28 31 00	ADDRESSABLE FIRE ALARM SYSTEM
28 50 00	BI-DIRECTIONAL ANTENNA SYSTEM (BDA)
28 55 00	RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA/REPEATER SYSTEM (ERRRS)

<u>Full Name</u>	<u>Discipline</u>
Matthew C. Briley	Electrical/Fire Alarm
IMEG Consultants Corp.	
Firm License #F-1507	

Matthew C. Briley, PE
PE License #048828
3221 Blue Ridge Rd. Ste. 113
Raleigh, NC 27612
Phone: 919-571-1111
E-mail: matthew.c.briley@imegcorp.com



NOTICE TO BIDDERS

Pursuant to Section 143-129 of the General Statutes of North Carolina, sealed proposals for “Franklin County Judicial Center Complex” will be received by Franklin County at the Franklin County Administration Building located at **113 Market Street, Louisburg, NC 27549, until 2:00 P.M., on September 30, 2025**, at which time they will be publicly opened and read. All bids must be marked with “Franklin County Judicial Complex” and “SEALED BID” on the outside of the envelope. Franklin County reserves the right to reject any and all bids.

Project: New Judicial Center & Annex Renovations for Franklin County, NC

The Project consists of construction of a three-story, 56,000 square foot new Judicial Center and the renovations of an existing 14,000 square foot Courthouse Annex facility. New construction for the Judicial Center includes structural steel columns, beams & roof framing, exterior CMU walls with brick veneer, precast concrete and metal panels, membrane roofing, elevator systems for vertical circulation, interior steel stud walls with gypsum wallboard, suspended ceilings, new windows, doors & hardware, new finishes, new mechanical, plumbing, electrical and fire protection systems, site grading, stormwater management, public parking, secure sallyport & staff parking, courtyard/plaza entry. Courthouse Annex renovations will include complete renovations within the existing exterior walls and roof structure. New construction within the shell facility consists of similar materials described above.

An open **Pre-bid Meeting** will be held at **2:00 PM on September 10, 2025**, at the Franklin County Administration Building, located at 113 Market Street, Louisburg, NC 27549. The meeting will address project specific questions, issues, bidding procedures and bid forms.

Bids will be received for Single Prime Contracts. All proposals shall be lump sum.

Complete plans and specifications for this project are available free of charge for a Digital Download or for \$350.00 (refundable) deposit by cash or certified check for hard copies. Either format can be obtained from Oakley Collier Architects, 109 Candlewood Road, Rocky Mount, NC 27804 (252) 937-2500 beginning September 4, 2025, during normal office hours, or by emailing Ashley Seaman (aseaman@oakleycollier.com). Plans will also be available in the plan rooms of the Carolinas Associated General Contractors, Raleigh, NC, in the local North Carolina offices of Dodge Data & Analytics, and in the Construct Connect in Norcross, GA and in Minority Plan Rooms in the NC Institute of Minority Economic Development, Inc in Durham, NC and in East Coast Digital – Minority Plan Room Provider, Greenville, NC.

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

General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for “Unlimited”.

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, of an amount equal to not less than five percent (5%) of the proposal or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the

bid executed by a surety company licensed under the laws of North Carolina to execute such bonds, conditioned that the surety will, upon demand forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract in accordance with the bid bond. Said deposit shall be retained by the Owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten days after the award or to give satisfactory surety as required by law.

A Performance Bond and a Payment Bond will be required for one hundred percent (100%) of the contract price.

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

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of **90 days**.

Franklin County reserves the right to reject any or all bids and to waive informalities.

Owner: Franklin County
Ryan Preble
113 Market Street
Louisburg, NC 27549

Architect: Joseph F. Klimek, AIA
Oakley Collier Architects, PA
109 Candlewood Road
Rocky Mount, NC 27804

AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:

(Name, location, and detailed description)

New Judicial Center & Courthouse Annex Renovations

THE OWNER:

(Name, legal status, address, and other information)

Franklin County
113 Market Street
Louisburg, NC 27549

THE ARCHITECT:

(Name, legal status, address, and other information)

Oakley Collier Architects, P.A.
109 Candlewood Road
Rocky Mount, NC 27804

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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.

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.)

§ 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.)

§ 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.

§ 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.)

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

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

§ 3.4.4 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.)

§ 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 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.)

§ 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 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:

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

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.

§ 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.)
- .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
.6	Specifications	

Section	Title	Date	Pages
.7	Addenda:		

Number	Date	Pages
.8	Other Exhibits: <i>(Check all boxes that apply and include appropriate information identifying the exhibit where required.)</i>	
<input type="checkbox"/>	AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below: <i>(Insert the date of the E204-2017.)</i>	
<input type="checkbox"/>	The Sustainability Plan:	
	Title	Date Pages
<input type="checkbox"/>	Supplementary and other Conditions of the Contract:	
	Document	Title Date Pages
.9	Other documents listed below: <i>(List here any additional documents that are intended to form part of the Proposed Contract Documents.)</i>	

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

Note the following changes and additions to the printed AIA Document A701, Instructions to Bidders, 2018 Edition.

ARTICLE 3 - BIDDING DOCUMENTS

Add the following subparagraphs to Section 3.2:

"3.2.4 Whenever there are discrepancies between Drawings, or between the Drawings and Specifications, or conflicts within the Specifications, and such discrepancy is not called to the Architect's attention in time to permit clarification by Addendum, the bidder shall base his bid upon providing the better quality or greater quantity of work or material called for, shall submit a written statement with his proposal noting such discrepancies, and shall so furnish and install such better quality or greater quantity unless otherwise ordered in writing."

ARTICLE 4 - BIDDING PROCEDURES

Add the following to Subparagraph 4.1.1:

"Proposals shall be submitted on the extra proposal form attached to this Project Manual. The Form of Proposal bound into the Project Manual is for reference only and shall not be removed. Proposals submitted shall include the following items: Single-Prime General Contractor Form of Proposal, Bid Bond, and MBE forms."

Add the following Subparagraphs 4.2.5 and 4.2.6:

4.2.5 Bids shall be accompanied by a cash-deposit or a certified check drawn on and certified by a bank or trust company insured by the Federal Deposit Insurance Corporation, in an amount not less than 5 percent of the bid, or in lieu thereof, a bidder may offer a bid bond of 5 percent of bid.

"4.2.6 Certified checks and/or Bid Bonds shall be pinned or clipped to the Proposal Form."

Add the following to Subparagraph 4.3.1:

"Proposals shall be hand carried to the time and place indicated in the Contract Documents by a representative of the Contractor, in sealed envelopes bearing the address of the Owner, the name of the project, the bidder's name, and State license number. Bids may also be delivered by certified mail, receipt required."

Add the following to Subparagraph 4.4.1:

"No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of ninety (90) days."

Add the following to Subparagraph 4.4.2:

"Proposals may be modified by an authorized representative of the bidder **IN PERSON AT PLACE OF BID OPENING PRIOR TO TIME OF OPENING BIDS ONLY**. Modifications submitted by any other means **WILL NOT BE CONSIDERED**."

ARTICLE 5 - CONSIDERATION OF BIDS

Subparagraph 5.3.1 – Delete and substitute the following 5.3.1:

"It is the intention of the Owner to award the contract to the most suited responsive bidder submitting the proposal to the Owner and whose construction skill and financial resources are fully equal to the task of executing the work in a rapid and satisfactory manner, and of completing the work within the time limit. 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."

Add the following to subparagraph 5.3.2:

"The Owner's acceptance of any or all alternates will not extend the stated contract time."

"The basis of contract award for the work required for the complete project will be the lowest single-prime bid. Failure of the Proposer to fully and accurately complete the bid form, including names of subcontractors will cause single prime bids to be rejected as non-responsive."

ARTICLE 6 - POST BID INFORMATION

Delete Paragraph 6.2

Add the following to Subparagraph 6.3.1:

"The successful Bidder(s), within 7 days following the opening of bids, shall submit a letter to the Architect which shall verify that the Contractor(s) complied with the Owner's Minority Business Guidelines and specify any other efforts to the Contractor(s) made to recruit minority subcontractors and minority suppliers for work on this project. This letter should include copies of any advertisements or correspondences the Contractor(s) has made to recruit minority subcontractors and suppliers. Further, a list of awards that have been or will be offered to minority subcontractors and suppliers and a list of others that were recruited shall be included."

Add the following to Subparagraph 6.3.4:

"The Bidder shall furnish upon request adequate data on any named entity on the list in order to permit the Architect and Owner to conduct a proper evaluation. Failure to object to a manufacturer shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements."

ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

Delete subparagraph 7.2.1 and replace with the following subparagraph 7.2.1

"The Bidder shall deliver the required bonds to the Owner prior to the date of execution of the Contract."

ARTICLE 8 – ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

Delete subparagraph 8.1.2, 8.1.4

Add the following to Subparagraph 8.1.5:

"Bid Set Drawings, August 2025"

Add the following to Subparagraph 8.1.6:

"Project Manual, August 2025"

Add the following to Subparagraph 8.1.9:

"- SUPPLEMENTARY GENERAL CONDITIONS
- AIA DOCUMENT A701-2018, INSTRUCTIONS TO BIDDERS
- SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
- GEOTECHNICAL ENGINEERING REPORT
- GEOTECHNICAL ENGINEERING ADDENDUM 2 -FOUNDATION BEARING CAPACITY
- FORM OF SINGLE PRIME GENERAL CONTRACTOR PROPOSAL
- IDENTIFICATION OF HUB CERTIFIED/ MINORITY BUSINESS PARTICIPATION
- AIA DOCUMENT A310-2010, BID BOND
- AIA DOCUMENT A312-2010, PERFORMANCE BOND
- AIA DOCUMENT A312-2010, PAYMENT BOND
- AIA DOCUMENT G704-2017, CERTIFICATE OF SUBSTANTIAL COMPLETION "

END OF SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

This page intentionally left blank

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

New Judicial Center & Courthouse Annex Renovations

THE OWNER:

(Name, legal status and address)

Franklin County
113 Market Street
Louisburg, NC 27549

THE ARCHITECT:

(Name, legal status and address)

Oakley Collier Architects, P.A.
109 Candlewood Road
Rocky Mount, NC 27804

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
14	TERMINATION OR SUSPENSION OF THE CONTRACT
15	CLAIMS AND DISPUTES

ADDITIONS AND DELETIONS:

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

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

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

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

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

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

Init.

AIA Document A201™ – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017 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 produced by AIA software at 15:16:27 ET on 11/06/2018 under Order No 6883209444 which expires on 04/08/2019, and is not for resale.

User Notes:

(862737995)

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

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

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

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

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

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

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

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.

§ 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 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.

§ 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 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.

§ 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.

§ 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 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 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.

§ 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.

§ 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.

§ 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.

§ 4.2.8 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.

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 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.

§ 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.

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .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

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.

§ 8.3.2 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.

§ 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 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.

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (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.

§ 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.

§ 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.

§ 9.8.3 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.

§ 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.

§ 9.10.3 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

- .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 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 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 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.

§ 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 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.

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 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 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

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 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, 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.

§ 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.

SUPPLEMENTARY GENERAL CONDITIONS

STANDARD AIA FORMS

General Conditions of the Contract Standard Form A201 (Latest Edition) of the American Institute of Architects are hereby made a part of the specifications and are bound herein. The General Conditions including Modifications and Special Conditions herein, shall become a part of the contract, and shall apply to all Contractors and all subcontractors.

SUPPLEMENTS TO AIA DOCUMENTS A201

The following supplements modify, change, delete from or add to the "General Conditions of the Contract for Construction, 'AIA Document A201.' Where any Article of the General Conditions is modified, or any Paragraph, Subparagraph or Clause thereof is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

Add the following:

1.1.5.1 PRODUCT

The term "product" as used in the Contract Documents includes materials, systems and equipment.

1.1.6.1 PROJECT MANUAL

The term "Project Manual" as used in this section is the volume that includes the bidding requirements, Conditions of the Contract and the Specifications.

1.1.8.1 CONTRACTOR

The term "Contractor" shall mean the Contractor involved with this project.

1.1.9 GENERAL CONTRACTOR

The term "General Contractor" shall mean the Contractor responsible for the General Contract Work.

1.1.10 SUBCONTRACTOR

The term "subcontractor" shall mean subcontractor employed by the Contractor.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

Add the following paragraph:

3.1.1.1 – The Contractor shall have a minimum of 10 years of experience in projects of similar scope and complexity and in historic building renovation and restoration.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following paragraph:

3.3.2.1 - The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Add the following paragraphs:

3.12.11.1 - Products are generally specified by ASTM or other reference standard, and/or by manufacturer's name and model number or trade number. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed.

3.12.11.2 - After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:

1. The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts.
2. The request is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.

3.12.11.3 - Requests for substitution based on Clause 3.12.11.2 above, when forwarded by the Contractor to the Architect, are understood to mean that the Contractor:

1. Represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
2. Will provide the same guarantee for the substitution that he would for that specified;
3. Certified that the cost data presented is complete and include all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent; and
4. Will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

3.12.11.4 - Substitutions will not be considered if:

1. They are indicated or implied on shop drawing submissions without the formal request required in Clause 4.4.1.3 above; or
2. For their implementation they require a substantial revision of the Contract Documents in order to accommodate their use.

3.12.11.5 - When required, three samples of sufficient size to indicate general visual effect shall be submitted. Where samples must show a range of color, texture, finish, graining, or other similar property, submit three sets of pairs illustrating the full scope of this range. One set of "Approved" samples will be retained at the Architect's project office.

3.15 CLEANING UP

Add the following paragraph:

3.15.1.1 - The Contractor shall remove rubbish and leave the building broom clean, clean all glass, replace all broken glass, remove stains, spots, marks, and dirt from the decorated work: clean hardware, remove paint spots and smears from all surfaces, clean fixtures and wash all concrete, tile and cement floors, polish all resilient floors. Cleanup will be performed at the end of each day and will be monitored by the Owner and Architect.

3.18 INDEMNIFICATION:

Delete subparagraph 3.18.1 in its entirety and modify per the following:

3.18.1 To the fullest extent allowed by law, Contractor shall indemnify and hold harmless Engineer, Owner, its officers, officials, employees, agents, consultants and subcontractors of each or indemnities (collectively called "Indemnified Parties") from and against those Losses, liabilities, damages, and costs arising out of bodily injury to persons or damage to property proximately caused by, arising out of, or

resulting from the sole negligence of the Contractor, the Contractor's agents, or the Contractor's employees.

Change subparagraph 3.18.2 to be 3.18.7

Add the following subparagraphs:

3.18.2 In matters other than those covered by subsection 3.18.1, above, and to the fullest extent allowed by law, Contractor shall indemnify and hold harmless the Indemnified Parties from and against those Losses, liabilities, damages, and costs caused by, arising out of, resulting from, or in connection with the execution of the work provided for in this Project when the Fault of the Contractor or its Derivative Parties is a proximate cause of the Loss, liability, damage, or expense indemnified. In no event shall the Owner be liable for the collapse of adjacent buildings caused by the demolition of the building under this project.

3.18.3 Nothing in section 3.18 shall be construed to require Contractor to defend Engineer, Owner, its independent contractors, agents, employees, indemnitees, or any other person or entity against liability or claims for damages or expenses, including attorney's fees, proximately caused or allegedly caused by the professional negligence, in whole or in part, of the Contractor, Engineer, Owner, or their Derivative Parties, whether the claim is alleged or brought in tort or contract.

3.18.4 Costs and expenses shall include attorneys' fees, litigation or arbitration expenses, or court costs actually incurred by the Indemnified Parties to defend against third-party claims alleged in any court, tribunal, or alternative dispute resolution procedure required of any of the Indemnified Parties by law or by contract, only if the Fault of the Contractor or its Derivative Parties is a proximate cause of the attorney's fees, litigation or arbitration expenses, or court costs to be indemnified.

3.18.5 The Contractor's duty to indemnify and hold harmless described hereinabove shall survive the termination or expiration of this Contract.

3.18.6 Definitions:

- i. For the purposes of this section the term "Fault" shall mean any breach of contract; negligent, reckless, or intentional act or omission constituting a tort under applicable statutes or common law; or violation of applicable statutes or regulations.
- ii. For the purposes of this section the term "Loss" or "Losses" shall include, but not be limited to, fines, penalties, and/or judgments issued or levied by any local, state, or federal governmental entity.
- iii. For the purposes of this section the term "Derivative Parties" shall mean any of the Contractor's subcontractors/ subcontractors, agents, employees, or other persons or entities for which the Contractor may be liable or responsible as a result of any statutory, tort, or contractual duty.

ARTICLE 4 ARCHITECT

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

Add the following paragraphs:

4.2.1.1 - All instructions to the contractor will be made only by or through the designer or his designated project representative. Observations made by official representatives of the owner shall be conveyed to the designer for review and coordination prior to issuance to the contractor.

4.2.1.2 - All work shall be inspected by designer and/or special inspector prior to being covered by the contractor. Contractor shall give a minimum two weeks' notice unless otherwise agreed to by all parties. If inspection fails, after the first re-inspection all costs associated with additional re-inspections shall be borne by the contractor.

4.2.1.3 - Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.

4.2.1.4 - Should any work be covered up or concealed prior to inspection and approval by the designer and/or special inspector such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the contractor involved.

4.2.6.1 - Mechanics whose work is unsatisfactory to the owner, or unskilled or otherwise objectionable, shall be instantly dismissed from the work upon notice of the Architect.

ARTICLE 5 SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 - Change first sentence to read: Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, within 5 days from the contract date, shall furnish to the owner and architect in writing the names or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the work.

ARTICLE 7 CHANGES IN THE WORK

7.2 CHANGE ORDERS

Add the following paragraphs:

7.2.2 – In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:

1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, and Owner the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except in such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph 7.2.2.2 herein. If neither party elects to proceed under 7.2.2.2, then unit prices shall apply.
2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

7.2.3 - Under Paragraph 7.2.2, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc.)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc. contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under 7.2.2, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.

7.2.4 - The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:

1. The actual costs of materials and supplies incorporated or consumed as part of the work;
2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.
3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker's compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;
4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;
5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the work.
6. Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the owner.

7.2.5 - Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined in 7.2.4.

7.2.6 - In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer, the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature.

7.2.7 - A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.

ARTICLE 8 TIME

8.2 PROGRESS AND COMPLETION

Delete and substitute the following:

8.2.3 - "The Contractors shall commence work to be performed under this agreement on a date to be specified in a written order from the architect or corresponding to the date of the Pre-construction conference and shall fully complete all work hereunder as follows:

540 Days

8.3 DELAYS AND EXTENSIONS OF TIME

Add the following paragraphs:

8.3.1.1 - Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the

same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the contractor reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

8.3.1.2 - Request for extension of time shall be made in writing to the designer, copies to the owner, within twenty (20) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the Designer, copies to the owner, of the delay within 20 days of the beginning of the delay and only one claim is necessary.

8.3.1.3 - The contractor shall notify his surety in writing of extension of time granted.

8.3.1.4 - No claim for time extension shall be allowed on account of failure of the designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

Liquidated Damages

Time extensions for weather delays do not entitle the Contractor to extended overhead recovery. As outlined in Article 3 of the Agreement, the Contractor agrees to pay \$500.00 per day liquidated damages to the owner for each calendar day the Contractor shall be in default.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENTS

Add the following to Subparagraph:

9.3.1 - The form of Application of Payment shall be on AIA Document G702 "Application and Certificate for Payment". Applications for Payment shall be accompanied by NC Sales Tax Report(s) submitted monthly, regardless of whether sales tax was incurred during the period covered by the Application for Payment. Sales Tax Report(s) shall be notarized and shall include all information required by NC Department of Revenue.

Add the following Subparagraph:

9.3.1.3 - Until final payment the Owner will pay ninety-five (95%) percent of the amount due the Contractor on account of progress payments. There will be no reduction in the (5) percent retainage withheld after substantial completion. Retainage will be released upon final completion and acceptance of the project and receipt of the Certificate of Compliance with the building inspection authority having jurisdiction over the project. The General Contractor shall be responsible for securing such certification.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Subparagraphs:

10.1.1 - If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop the Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in Subparagraph 10.2.

10.1.2 - The Owner shall be responsible for obtaining the services of a licensed laboratory to verify a 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 verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has a reasonable 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.

10.2.8.1 Contractor shall be responsible for all repairs and damage caused during the demolition or construction process. In no event shall the Owner be liable for damage to adjacent buildings caused by the work completed under this Project. The Contractor shall indemnify and save harmless the Owner against all losses, claims, demands, payments, suits, actions, recoveries, and judgments, including attorney's fees and costs associated with the aforementioned, of every nature and description brought or recovered against it by reason of any act or omission of the Contractor, its agents and employees, in the execution of the Work under this Project that results in the damage to property or buildings adjacent to the Project.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE:

Add the following to subparagraph:

11.1.1 – The Owner is listed as an additional insured on the Contractor’s COI and that they require all subcontractors to list Franklin County as an additional insured on all COI.

Add the following Subparagraph:

11.1.1.1 - Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- Premises-Operations (including X-C-U)
Independent Contractor's protective.
- Products and completed operations.
Contractual-including specified provisions for the Contractors obligations under paragraph 4.18.
- Owned, non-owned and hired motor vehicles.
- Broad form coverage for property damage.

Add the following Subparagraph:

11.1.1.2 - Provide the following insurance limits:

Workers Compensation

Applicable Federal, State	<u>\$Statutory</u>
Employer's Liability - Each Accident	<u>\$1,000,000.00</u>
Disease Policy Limit	<u>\$1,000,000.00</u>
Disease Limit per Each Employee	<u>\$1,000,000.00</u>

Contractor's LIABILITY INSURANCE (clauses 1.1.1.2,.3,.4,.5,.6,.7) including CONTRACTUAL LIABILITY (subparagraph 11.1.2)

Form of insurance shall be:
Comprehensive General Liability
Comprehensive Automobile Liability

NOTE: The Owner and the Architect shall be included as additional insured parties on the Comprehensive General Liability Policy.

(1) BODILY INJURY	
Each Occurrence	<u>\$1,000,000.00</u>
General Aggregate	<u>\$2,000,000.00</u>
Product Liability Completed Operations Aggregate	<u>\$2,000,000.00</u>

(2) PROPERTY DAMAGE - including completed operations broad form and X,C,U

Each Occurrence	<u>\$1,000,000.00</u>
Aggregate	<u>\$3,000,000.00</u>
(3) PERSONAL INJURY	
Each Persons Aggregate	<u>\$ 500,000.00</u>
General Aggregate	<u>\$1,000,000.00</u>
Catastrophic Liability	<u>\$1,000,000.00</u>
(4) AUTOMOBILE LIABILITY - owned, non-owned and hired	
Bodily Injury each person	<u>\$2,000,000.00</u>
Bodily Injury each accident	<u>\$2,000,000.00</u>
Property Damaged each occurrence	<u>\$ 500,000.00</u>
(5) INSTALLATION FLOATER - Per Project Requirements to Be Based Upon the Most Expensive Piece of Equipment to Be Provided.	
(6) BUSINESS UMBRELLA POLICY	
Over Primary Insurance	<u>\$5,000,000.00</u>
Retention	<u>\$ 10,000.00</u>

Add the following Subparagraph:

11.1.1.3 - The Contractor shall purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. The insurance shall include the interest of the Owner, Architect/Engineer, the Contractor, and subcontractors in the work and shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss or damage including without duplication of coverage, theft, vandalism and malicious mischief. The Contractor shall effect and maintain similar property insurance on portions of the work stored off the site or in transit when such portions of the work are to be included in an Application for Payment under Subparagraph 9.3.2.

The Architect/Engineer will also be insured under this policy to insure their interests.

Fire, Extended Coverage, Vandalism and Malicious Mischief in the names of the Owner, Architect/Engineer and Contractor as their interests may appear with limits as follows:

Amount equal to the Contract Sum for the Work

Independent Contractors: Same limits as above.

Products and Completed Operation:

Same limits as above for one (1) year, commencing with issuance of final certificate of payment.

Contractual Liability:

Same limits as above.

11.1.1.3.1 - Furnish three (3) copies of Certificates herein required; specifically setting forth evidence of all coverage required by Subparagraphs 11.1.1.

11.1.1.3.2 - The form of the Certificate shall be ACORD 25-S supplemented as necessary with AIA Document G715. Furnish copies of any endorsements that are subsequently issued amending coverage of limits. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

11.1.1.3.3 - If this insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payments made by the insurance carrier on claims paid by this insurance.

11.1.1.3.4 - The insurance required by Paragraph 11.3 is not intended to cover machinery, tolls or equipment owned or rented by the Contractor, which are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment which shall be subject to the provisions of Subparagraph 11.3.7.

11.4 PERFORMANCE BOND AND PAYMENT BOND:

Add the following Subparagraph:

11.1.1.4 – PERFORMANCE BOND AND PAYMENT BOND:

"Prior to signing contract, Contractor shall pay the premium for and furnish Performance and Payment Bond in the amount of the contract price on Form AIA 311 to cover faithful performance of the contract and payment of all obligations arising thereunder. Bonds shall be in such form as Owner may prescribe and with sureties as he may approve. Copy of Agent's Power-of-Attorney, giving him authority to sign bond and shall be furnished to the Architect. The Contractor shall provide six (6) copies."

11.2 Owner's Insurance

Modify the following Subparagraph 11.2.1:

Modify 'The Owner shall purchase...' to "The Owner may, but is not required to purchase..."

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Modify the following paragraph with the following:

Modify "The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules." to "The Contract shall be governed by the laws of the State of North Carolina and the exclusive venue shall be in the Courts of Franklin County, North Carolina."

ARTICLE 15 CLAIMS AND DISPUTES

15.1.4 CLAIMS FOR ADDITIONAL COST

Add the following paragraphs:

15.1.4.1 - Should the contractor consider that as a result of instructions given by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The contractor shall not proceed with the work affected until further advised. No claims for extra compensation shall be considered unless the claim is so made. The designer shall render a written decision within seven (7) days of receipt of claim.

15.1.4.2 - The contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.

ADD THE FOLLOWING ARTICLES 16-24:

ARTICLE 16 UTILITIES, STRUCTURES, SIGNS

The General Contractor shall call ULOCO at 1-800-632-4949 before conducting any sitework in order to avoid damaging existing underground utilities services.

The General Contractor shall provide necessary and adequate facilities and pay all costs for water, electricity, gas, oil, sewer, and other services that may be necessary and required for completion of the project according to the Contract Documents. Any permanent meters installed shall be Owner.

Meters shall be relisted in the Owner's name on the day following completion and acceptance of the General Contractor's work, and the Owner shall pay for services used after that date.

The Owner shall be reimbursed for all metered utility service charges paid by or attributed to the Owner after the meter is relisted in the Owner's name and prior to completion and acceptance of the work of all contractors. Reimbursement shall be made by the contractor whose work has not been completed and accepted. If the work of two or more contractors has not been completed and accepted.

If the work of two or more contractors has not been completed and accepted, reimbursement to the Owner shall be paid by the contractors involved on the basis of assessments by the Architect.

The General Contractor shall provide temporary plumbing, Heating and Electrical systems as required for his work and the work of other Prime Contractors until the permanent systems can be utilized for temporary purposes.

- A. Prior to acceptance of work by the Owner, each contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.
- B. Temporary filters shall be installed in each of the heating and air conditioning units during construction.
- C. Extra effort shall be maintained to keep the building clean and under no circumstances shall air systems be operated if finishing operations are creating dust in excess of what would be considered normal if the building were occupied. Provide filter media on return air grilles. The intent is to present the duct system in a clean condition at final inspection.
- D. It shall be understood that any warranty on equipment presented to the Owner shall extend from the day of final acceptance by the Owner. The cost of warranting the equipment during operation in the finishing stages of construction shall be borne by the Contractor whose system is utilized.
- E. When the permanent lighting system is used during the finishing stages of construction, lamps shall be replaced and shall be new at the time of final inspection.

The General Contractor shall provide temporary toilet facilities for male and female employees as required. These facilities will be available to other contractors on the job and shall be kept in a neat sanitary condition at all times. Chemical toilets are acceptable.

The General Contractor shall erect a temporary field office, complete with lights, telephone, heat and air conditioning.

ARTICLE 17 GUARANTEE

This Contractor shall guarantee in writing the materials and workmanship for a period of one year from the date of final acceptance by the Owner. This Contractor shall replace and/or repair, without cost to the Owner, any defective part or parts within the guarantee period.

ARTICLE 18 STORAGE OF MATERIALS

The Contractor shall make provisions for storage of materials on the site. Consult the owner for available space on the site.

ARTICLE 19 DEMOLITION

The General Contractor shall be responsible for all demolition and capping of all plumbing, HVAC and electrical lines.

ARTICLE 20 GUARANTEES AND OPERATION INSTRUCTION

All guarantees, warranties, operation instructions, maintenance instructions, etc. shall be delivered to the architect in triplicate, bound in a suitable three ring notebook. Originals with photocopies are acceptable.

ARTICLE 21 PARTIAL UTILIZATION BENEFICIAL OCCUPANCY

The Owner may desire to occupy all or a portion of the project when the work is substantially complete.

Prior to the final payment, the Owner may request the Contractor(s) in writing, through the Architect if applicable, to permit him to use a specified part of the project that he believes he may use without significant interference with construction of the other parts of the project. If the contractor(s) agree, the Architect will schedule a beneficial occupancy inspection after which the Architect may issue a Certificate of Substantial Completion. The certificate shall include the following documentation:

1. Date of substantial completion.
2. A tentative list of items to be completed or corrected before final payment.
3. Establishing responsibility between Contractor and Owner for maintenance, heat utilities and insurance.
4. Establishing the date for guarantees and warranties under terms of the Contract.
5. Consent of Surety.
6. Endorsement from Insurance Company permitting occupancy.

The Owner shall have the right to exclude the Contractor from any part of the project which the Architect has so certified to be substantially complete, but the Owner will allow the contractor reasonable access to complete or correct work to bring it into compliance with the contract.

Occupancy by the Owner under this Article will in no way relieve the Contractor from his contractual requirement to complete the project within the specified time. The Contractor will not be relieved of liquidated damages because of beneficial occupancy. The Architect may prorate liquidated damages based on the percentage of project occupied.

ARTICLE 22 CODES AND STANDARDS

Wherever reference is given to codes, or standard specifications or other data published by regulating agencies including but not limited to national Electrical Codes, North Carolina State Building Codes, Federal Specifications, ASTM Specifications, various Institute Specifications, etc., it shall be understood

that such reference is to the latest edition including addenda published prior to the date of the contract documents.

ARTICLE 23 ASBESTOS CONTAINING MATERIALS

Each Prime Contractor to provide an affidavit certifying that building materials, equipment, or any other component of this project does not contain asbestos.

ARTICLE 24 RECORD DRAWINGS

The General Contractor shall maintain (1) set of marked up construction drawings and specifications in addition to the working set normally used on the job. These record drawings will be presented to the Architect in good legible and clean condition at the completion of the project for record purposes.

END OF SUPPLEMENTARY GENERAL CONDITIONS



STEWART

STRONGER BY DESIGN

GEOTECHNICAL ENGINEERING REPORT

FRANKLIN COUNTY JUDICIAL CENTER

111 West Nash Street
Louisburg, North Carolina

November 4, 2022

GEOTECHNICAL ENGINEERING REPORT

FRANKLIN COUNTY JUDICIAL CENTER

111 West Nash Street
Louisburg, North Carolina

November 4, 2022

Prepared For:

Oakley Collier Architects
109 Candlewood Road
Rocky Mount, NC 27804

Prepared By:



STEWART
5400 Old Poole Road
Raleigh, NC 27610

Stewart Project No.: F22034.00

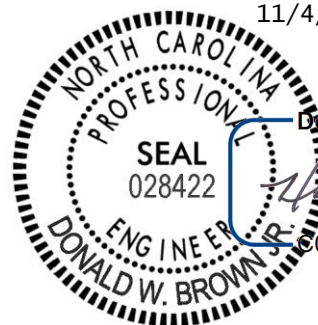
11/4/2022

DocuSigned by:

Heather Hancock

3409C94907FA477...

Heather Hancock, EI
Graduate Engineer, Geotechnical



DocuSigned by:

Donald W. Brown Jr.

006817F5F770411...

Donald W. Brown Jr., PE, LEED AP
Practice Leader | Geotechnical & Construction Services
NC PE License No. 28422

Stewart License No. C-1051

TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	1
2	PROJECT INFORMATION	2
2.1	Project Understanding	2
2.2	Site Location and Description	2
2.3	Geologic Area Overview	2
3	SUBSURFACE EXPLORATION	3
3.1	Field Testing	3
3.2	Laboratory Services	3
3.3	Subsurface Conditions	3
3.3.1	Ground cover	3
3.3.2	Fill soils	4
3.3.3	Residual soils	4
3.3.4	Weathered rock	4
3.3.5	Rock	4
3.3.6	Groundwater	4
4	ENGINEERING ASSESSMENT AND RECOMMENDATIONS	5
4.1	Site Grading	5
4.1.1	Subgrade Preparation	5
4.1.2	Old Fill	5
4.1.3	Difficult Excavation	6
4.1.4	Structural Fill	6
4.2	Foundations	7
4.2.1	Design	7
4.2.2	Construction	7
4.3	Slab-On-Grade	8
4.3.1	Design	8
4.3.2	Construction	8
4.4	Seismic Design Considerations	8
4.5	Pavement	9
4.5.1	Design	9
4.5.2	Construction	9

Appendix A

Site Vicinity Map
Boring Location Diagram
Historic Sanborn Maps

Appendix B

Boring Snapshot
Boring Summary Table
Boring Logs
Legend to Soil Descriptions

Appendix C

Site Photographs

1 EXECUTIVE SUMMARY

Stewart has completed a geotechnical exploration for the proposed Franklin County Judicial Center in Louisburg, North Carolina. This Executive Summary is provided as a brief overview of our geotechnical engineering evaluation for the project and is not intended to replace more detailed information contained elsewhere in this report. A summary of our findings, opinions, and recommendations is provided below.

- Current development plans for the subject site involve the design and construction of a three-story structure with a 17,900± sf footprint (50,800± gross). Site development will include an asphalt parking lot and a public plaza.
- A total of 14 soil test borings were performed for this geotechnical exploration. Borings were advanced to approximate depths ranging from 5.5 feet to 22 feet below the existing grade.
 - Fill and residual soil with USCS classifications of Silty SAND (SM), Clayey SAND (SC), Lean CLAY (CL), Fat CLAY (CH), Clayey SILT (MH) were encountered in the borings.
 - Weathered rock was encountered in eight borings at approximate depths of 3 feet to 17 feet below the existing ground surface.
 - Auger refusal on rock was encountered in nine borings at depths of approximately 5.5 feet to 22 feet below the current grade.
 - Groundwater was encountered in two borings at approximate depths of 14 feet and 15.3 feet below the existing ground surface.
- Difficult excavations caused by shallow weathered rock should be expected in the southwest quadrant of the site.
- The site contains a significant amount of old fill that appears to be uncontrolled. Isolated undercut and replacement should be anticipated through the course of construction.
- The structure should be designed using a Seismic Site Class C.
- The use of conventional spread footings and slab-on-grade are recommended for the proposed building.

The owner/designer/contractor should not rely solely upon the summary above. This report should be read in its entirety prior to implementing the recommendations in the preparation of design and construction documents. Stewart should be retained to perform sufficient services to determine plan/specification compliance with the recommendations in this report.

2 **PROJECT INFORMATION**

2.1 **Project Understanding**

As we understand it, current redevelopment plans for the subject site involve the design and construction of a three-story, 50,800± sf (gross) judicial office building. A portion of the new building will be constructed over the west end of the existing Annex Building. A new single-story staff entry addition is also planned on the south side of the Annex Building. Site development will include an asphalt parking lot on the west side of the parcel and public plaza space on W. Nash St. A site grading plan was not available at the time of this report, so we have assumed a finished floor elevation similar to the Annex and cuts/fills will be 1 foot or less.

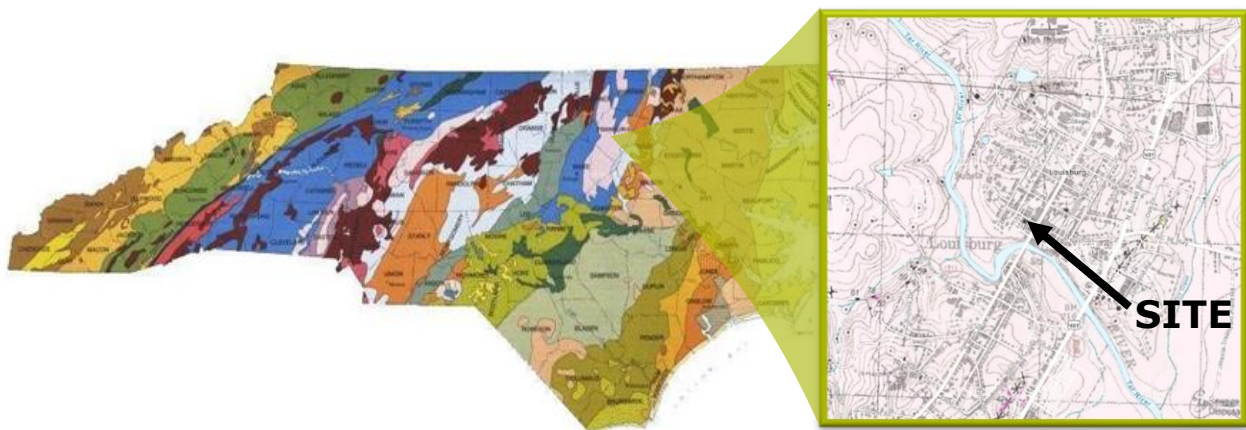
2.2 **Site Location and Description**

The site is located south of W Nash Street, between S Church Street and S Main Street in Louisburg, North Carolina. The site is immediately west of the existing Annex Building and currently developed with a concrete parking lot, a small gravel parking lot, and a larger asphalt parking lot. Please refer to Figure A1 in [Appendix A](#) of this report for the Site Vicinity Map.

Based on the Franklin County GIS topographic data, the subject site slopes downward from north to south with a relief of approximately 8 to 10 feet. Site photographs are included in [Appendix C](#) of this report.

2.3 **Geologic Area Overview**

The project site is located in central Franklin County, which is within the Piedmont Geologic Province of North Carolina. Review of the *Bedrock Geologic Map of the Louisburg 7.5-minute Quadrangle, Franklin County, North Carolina* (2010) indicates that the subject site is primarily underlain by granite (PPgd) of the Rolesville batholith.



Based on our local experience, differential weathering of the parent bedrock has resulted in highly variable subsurface conditions. Both soil and rock conditions tend to vary considerably over relatively short horizontal and vertical distances. Furthermore, suspended boulders, discontinuous rock layers/lenses, rock pinnacles and/or zones of weathered and fractured rock are commonly encountered within the residual soils in this area.

3 SUBSURFACE EXPLORATION

3.1 Field Testing

The geotechnical exploration consisted of 14 soil test borings – eight for the building (B-1 thru B-8) and six for the remainder of the site (P-1 thru P-6). An additional building boring was planned for the grass strip between the two existing buildings in the northern portion of the site but could not be completed due to utilities in the area. The boring layout is illustrated by Figure A2 in [Appendix A](#) of this report.

The borings were advanced to approximate depths ranging from 5.5 to 22 feet below the current ground surface. The borings were performed by J&L Drilling, Inc. with a truck-mounted CME 75 drill rig using 2¼-inch (ID) hollow-stem, continuous flight augers in general accordance with ASTM D6151. Sampling operations were conducted in general accordance with ASTM D1586. At predetermined intervals, soil samples were obtained with a split-barrel sampler (standard 2-inch O.D.). The sampler was rested on the bottom of the borehole and driven to a penetration of 18 inches (or fraction thereof) with blows of a 140-pound manual drop hammer falling a distance of 30 inches. Of the 18 inches, the number of hammer blows required to achieve 6 inches of penetration is recorded for three consecutive segments. The sum of the blow counts for the second and third 6-inch segment is termed the Standard Penetration Test (SPT) resistance, or N-value. The N-values presented on the Boring Logs and Boring Snapshot are the actual, field-recorded blow counts and do not include correction factors for hammer energy or overburden soil pressures.

3.2 Laboratory Services

The soil samples obtained during the drilling operations were placed in labeled containers and transported to our laboratory where they were visually-manually classified in general accordance with ASTM D2488 and logged by a member of Stewart's geotechnical engineering staff. The Boring Logs are included in [Appendix B](#) of this report. All untested soil samples will be stored for two months before discarding.

3.3 Subsurface Conditions

The following is a subsurface description of a generalized nature, provided to highlight the major soil strata encountered. The stratification of the subsurface materials illustrated on the Boring Logs and Boring Snapshot represent the conditions at the actual test locations; therefore, variations should be expected between borings. Stratigraphy boundaries only represent the approximate depth/elevation of a noticed material change but the transition between material types is typically gradual. The soil types are based on the Unified Soil Classification System (USCS).

Please note that the ground surface elevations at the boring locations could not be estimated for this report due to the large contour intervals (10 feet) in the Franklin County GIS.

3.3.1 Ground cover

Boring B-1 was performed in the existing concrete parking lot and encountered 3 inches of concrete at the ground surface. Borings B-2, B-4, B-5, B-7, B-8, P-5, and P-6 were performed in the existing asphalt parking lot and encountered 2 to 3 inches of asphalt underlain by 2 to 3 inches of stone base at the ground surface.

A 1- to 3-inch thick veneer of topsoil was encountered in borings P-1, P-2, P-3, P-4, B-3, and B-6.

3.3.2 Fill soils

Fill is a material that was placed during previous grading activities. Such material was encountered in nine of the 14 soil test borings, extending to approximate depths of 2 to 8 feet below the existing ground surface.

The fill encountered on site included soft Clayey SILT (MH), medium stiff to stiff Lean CLAY (CL), medium stiff to stiff Fat CLAY (CH), loose to medium dense Silty SAND (SM), and loose Clayey SAND (SC). The SPT N-values within fill ranged from 2 to 15 blows per foot. Some fill samples retrieved on site contained variable amounts of organic material, coal, terracotta, and gravel.

3.3.3 Residual soils

Residual soils are the weathered, undisturbed remains of the parent rock. Residual soil was encountered in 13 borings (all except for boring P-6) below the aforementioned ground cover and/or fill layers. Residual soil encountered at the site consisted of stiff Clayey SILT (MH), stiff Lean CLAY (CL), medium stiff to stiff Fat CLAY (CH), and very loose to very dense Silty SAND (SM). The N-values within the residuum ranged from 2 to 61 blows per foot.

3.3.4 Weathered rock

Weathered rock (WR) is a transitional geomaterial between the parent rock and soil. For engineering purposes, weathered rock is defined by SPT N-values of 50 bpf with 6 inches or less penetration. Weathered rock was encountered in eight of 14 borings at approximate depths ranging from 3 feet to 17 below the current grade. The weathered rock samples were classified as granite.

3.3.5 Rock

Rock is defined as native material of sufficient hardness to refuse mechanical drilling equipment. Auger refusal was encountered in nine of 14 borings at approximate depths of 5.5 feet to 22 feet below the current grade. In the absence of rock coring/sampling, the rock is assumed to be granite like the overlying WR stratum.

3.3.6 Groundwater

Groundwater was encountered in borings B-1 and B-5 at approximate depths of 15.3 feet and 14 feet below the existing ground surface, respectively. All boreholes were backfilled with auger cuttings (soil) after groundwater measurements were complete for public safety.

The groundwater conditions represent the conditions at the time of the exploration. Fluctuations in groundwater levels are common and should be expected. Common factors that influence groundwater levels include, but are not limited to, soil stratification, climate/weather, nearby bodies of water (lakes, ponds, etc.), underground springs, streams, rivers and surface water discharge.

4 ENGINEERING ASSESSMENT AND RECOMMENDATIONS

4.1 Site Grading

4.1.1 Subgrade Preparation

Initially, all topsoil, root mat, vegetation, building foundation/slabs, pavement and any other unsatisfactory or deleterious materials should be removed from the proposed construction area. This material shall be considered unsuitable for reuse and should be hauled offsite, bermed onsite, or otherwise wasted in nonstructural areas.

After stripping the site, the exposed subgrade in proposed fill areas, or already at-grade, should be thoroughly densified with a large roller. Following densification, these areas should be proofrolled with a tandem-axle dump truck weighing between 15 and 20 tons. Proofrolling should occur in the presence of the owner's testing agency so that recommendations can be provided for areas that rut, pump, or deflect excessively. Proofrolling should not be performed on frozen or excessively wet subgrades.

Proper site drainage should be maintained during earthwork operations to reduce the potential for wet weathered delays. Common approaches to reduce such delays include grading the area so that surface water flows away from the excavation, sealing exposed soil surface with a smooth-drum roller prior to precipitation events, and forming temporary ditches, swales, berms or other surface water diversion features. We also recommend limiting construction traffic during and after wet weather.

4.1.2 Old Fill

As previously mentioned in Section 3.3.2 of this report, there is a considerable amount of old fill on this site, extending to depths of approximately 2 feet to 8 feet below the current grade. Based on old Sanborn maps reviewed during preparation of this report, two of which are included in Figure A3 in [Appendix A](#), this block was once the site of several tobacco warehouses, storage buildings and a light industrial facility (gin mill). During this time (1910s and 1920s) it was not uncommon for such structures to have recessed floors or basements. In fact, the 1914 map mentions a basement containing fuel tanks in the northwest corner of the site. As such, it is reasonable to assume that some of the fill encountered onsite may be associated with backfill of old basements or filling in low areas of the former block.

Also as mentioned in Section 3.3.2, the fill encountered in the borings contained various amounts of foreign material (coal, organics, terracotta/brick, gravel, etc.). While their concentrations did not appear to be excessive in the samples collected, their presence suggest that the fill was placed in an uncontrolled manner. Furthermore, the variability of the SPT N-values within the fill stratum, several of which were low, reinforce the notion that the fill was placed in an uncontrolled manner. Such conditions elevate the risk level for encountering unforeseen (worse) conditions within the old fill during construction. While such risk is difficult to quantify, we expect the risk for this site to be moderate.

In general, the deeper and softer/looser fill soils were encountered outside of the building pad where they pose less of a risk to the proposed development. The exception is the area of borings B-2 and B-3 in the upper third of the building footprint. We recommend establishing a contingency budget for isolated undercutting and replacement in this area in case unsuitable soils are encountered during foundation excavation (and testing).

4.1.3 Difficult Excavation

Based on the WR elevations in the borings, we do not anticipate difficult digging conditions during mass grading. Difficult excavations should be expected in southeast quadrant of the site (B-5, B-7, P-6) for excavations extending more than 3 feet below the current ground surface (e.g., utility trenching and footings). Experience has shown that Piedmont materials with SPT N-values of 50 blows per 4 inches to 50 blows per 6 inches of penetration are generally rippable using a CAT D9 dozer using ripper tooth or large excavators (e.g., CAT 330) with rock teeth. Denser material such as rock or weathered rock with SPT N-values of 50 blows per 3 inches or less penetration will likely require hammering to facilitate removal.

4.1.4 Structural Fill

4.1.4.1 Selection

Whether imported or borrowed from an onsite source, structural fill should satisfy the following:

- No excessive deleterious material
- Organic content no greater than 3% (by weight)
- No rocks or other inclusions greater than 3 inches in diameter
- A maximum of 30% of the total material weight retained on the ¾-inch sieve
- Maximum Dry Density (MDD) of 95 pounds per cubic foot (pcf) or greater, as determined by the Standard Proctor Compaction Test (ASTM D698)
- Liquid Limit (LL) of 50 or less and a Plasticity Index (PI) of 25 or less, as determined by Atterberg Limits testing (ASTM D4318)

The ML, CL, and SM soils encountered onsite meet the LL/PI requirements and are therefore suitable for reuse as structural fill. We do not recommend the reuse of the onsite MH or CH soils in structural areas.

4.1.4.2 Moisture Conditioning

The water content of the structural fill should be maintained within $\pm 3\%$ of the material's optimum water content as determined by the Standard Proctor Compaction Test (ASTM D698); however, slight deviation from this can sometimes be tolerated depending on the grading plan and type of material being placed. Such deviation should be considered by the engineer representing the owner's material testing firm.

Please note that soils can be deemed unusable due to water content but shall not be classified as unsuitable based solely on water content. When soil water content falls outside of the requirements set herein, the contractor shall be responsible for taking appropriate measures to dry or wet the soil to a usable condition, unless otherwise agreed to by the Owner.

4.1.4.3 Compaction

When using large, ride-on compactors, fill should be placed in loose lifts measuring 8 to 10-inch thick. Lift thicknesses should be thinned to 4 to 6 inches when using smaller, Rammax-type compactors and no more than 4 inches thick for sled and jumping-jack tampers. Structural fill should be compacted to the requirements below, which are based on the soil's maximum dry density as determined by ASTM D698:

- Within 12 inches of finished subgrade elevation 98%
- Below 12 inches of finished subgrade elevation 95%

It is recommended that the placement and compaction of structural fill be monitored by an engineering technician from Stewart. Field compaction testing should be performed in accordance with ASTM D1556 (Sand Cone Method), ASTM D2167 (Rubber Balloon Method), ASTM D2937 (Drive Cylinder Method), or ASTM D6938/D8167 (Nuclear Methods).

4.2 Foundations

4.2.1 Design

The RFP provided by EM Structural indicates column loads ranging from 100 to 350 kips. Based on these structural loads, the anticipated grading, and the site preparation recommendations provided in this report, we recommend the use of conventional shallow spread footings to support the structure. For design of the foundations, we recommend the parameters provided in the Table 1.

Table 1: Spread Footing Design Parameters

Parameter	Value
Net Allowable Soil Bearing Capacity, psf	2,000
Minimum Bearing Depth, in.	24
Minimum Wall Footing Width, in.	18
Minimum Column Footing Width, in.	36
Estimated Post-Construction Settlement, in. Total Differential	1 or less ¼ to ½
Moist Soil Unit Weight, pcf	120
Passive Earth Pressure Coefficient ¹	2.88
Ultimate Friction Factor ($\tan \delta$)	0.32
<i>Notes:</i> 1. We recommend that a safety factor of at least 1.5 be used to determine the soil's allowable passive resistance and the soil's allowable friction.	

4.2.2 Construction

It is preferable for spread footing excavations to be performed using a bucket with a flat cutting edge (no teeth) to reduce disturbance of the exposed bearing soil. Regardless, footing bottoms should be tamped with a jumping-jack or sled compactor prior to the foundation inspection and placement of reinforcing steel. Footings should be clean of loose material and debris and protected from disturbance. This includes protection from surface water run-off and freezing. If water is allowed to accumulate within a footing excavation and soften the bearing soils, or if the bearing soils are allowed to freeze, the deficient soils should be removed from the excavation and rechecked by Stewart personnel prior to concrete placement. When concrete cannot be placed immediately, we recommend placing a mud-mat to protect the bearing soil.

Foundation bearing soils should be checked by Stewart personnel during construction to verify satisfactory bearing conditions (i.e., materials and strength). This typically involves using a ½-inch diameter, T-handled probe rod for an overall qualitative assessment throughout the foundation excavations, followed by strategically placed hand auger borings and Dynamic Cone Penetrometer (ASTM STP-399) testing for quantitative evaluation. DCP testing should be performed in accordance with and completed prior to stone, steel, or concrete placement. Unsuitable soil detected during this evaluation should be repaired as directed by the testing agency.

As mentioned in Section 4.1.2 of this report, unsuitable soils could be encountered while excavating or checking bearing conditions in the area of borings B-2 and B-3. If so, the suitable material should be repaired as recommended by the Owner's testing agency. We anticipate repair to consist of undercutting and replacing with compacted structural fill soil.

4.3 Slab-On-Grade

4.3.1 Design

In designing the slab-on-grade, we recommend a minimum 4-inch base layer of washed No. 57 stone to provide uniform support and to provide a capillary break. We also recommend the installation of a vapor barrier as a measure of protection against water vapor intrusion. Even when groundwater is relatively deep, omitting the vapor barrier could lead to water vapor transmission through the slab and cause damage to flooring and/or cause elevated moisture levels within the structure. We recommend considering the use of a vapor barrier meeting ASTM E1745, which should be installed per the ACI guidelines (ACI 302.2R) and ASTM E1643.

The design of the concrete slab-on-grade should be based on Westergaard's modulus of subgrade reaction (k). Based on the soil conditions encountered near the surface at the site, and the stone layer recommended above, we recommend using an effective value (k_{ef}) of 120 pci for slab design. However, if the floor slab will be heavily loaded or the design is otherwise sensitive to " k ", we recommend performing plate load testing in accordance with ASTM D1196 to allow site-specific refinement of the design k -value.

It is important to point out that cracking of concrete is normal and should be expected. Proper jointing of slabs is paramount in the control of cracking. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. Controlling the water-cement ratio of the concrete, particularly after batching, and including fiber reinforcement in the mix can also help reduce shrinkage cracking.

4.3.2 Construction

After the pad area is prepared as described in Section 4.1 of this report, it should be evaluated by the Stewart personnel to identify any weak or excessively unstable areas that require repair. This is typically accomplished by proofrolling with heavy, rubber-tired equipment such as a tandem-axle dump truck. In confined areas that cannot be proofrolled with a dump truck, use of smaller rubber tire equipment, probing, and/or DCP testing should be considered.

4.4 Seismic Design Considerations

Per the 2018 N.C. State Building Code, the design of a structure must consider dynamic forces resulting from seismic events, regardless of their likelihood of occurrence. As part of a generalized procedure to estimate seismic forces, the code assigns a Seismic Site Classification (letter designation of Class A through F) based on the subgrade soil/rock conditions within the upper 100 feet of the ground surface at the subject site. Based on our review of the SPT N-values, we recommend designing for a Seismic Site Class "C".

The following bulleted items briefly discuss our qualitative assessments of the other seismic-related issues. Detailed quantitative analyses for these items were not included in our Scope of Work and are not considered necessary at this time given the development plans and the subsurface conditions encountered.

- Liquefaction Hazard – Risk level is low – The soils encountered were of sufficient fines content and/or density to render them not readily liquefiable during the design earthquake.
- Slope Stability – Risk level is low - Based on the grading plan, neither tall nor overly steep cut/fill slopes are planned for construction.
- Surface Rupture – Risk is low – No active faults underlie the site.

4.5 Pavement

4.5.1 Design

For the subject site, we have assumed that typical traffic will consist of support for up to 1,000 passenger vehicles per day. Heavy-duty pavement areas are assumed to support an additional six delivery/box trucks per week, and two garbage trucks per week. We also anticipate that the heavy-duty pavement could also be subjected to random visits from heavy fire trucks (up to 80,000 lb.) during emergencies. Based on these traffic assumptions and the site preparation recommendations herein, we recommend the minimum pavement sections in Table 2.

Table 2: Asphalt Pavement Sections

Course	Light-Duty Thickness, in.	Heavy-Duty Thickness, in.
Surface (S9.5B)	2	3*
Aggregate Base (ABC)	6	8
* Two lifts required		

The flexible pavement design above is based on the standard 20-year design life and the NCDOT/AASHTO design procedure. All materials and workmanship used during construction should conform to the North Carolina Department of Transportation Standard Specifications for Roads and Structures, current edition.

4.5.2 Construction

The pavement recommendations herein are predicated by the assumption that the subgrade soils are suitable for pavement support and have been properly moisture conditioned and compacted to a uniform and stable condition. Experience has shown that most pavement failures are caused by localized soft spots in the subgrade or inadequate drainage. Proofrolling observed by an experienced engineer or technician from Stewart will reduce the likelihood of weak spots in the subgrade.

We recommend proofrolling finished subgrades, as well as the subsequently placed stone base, with a tandem-axle dump truck weighing between 25 and 35 tons. Proofrolling should occur in the presence of Stewart so that recommendations can be provided for areas that rut, pump, or deflect excessively. Proofrolling should not be performed on frozen or excessively wet subgrades. If subgrades are exposed to precipitation or freezing temperatures prior to paving, the area should be re-proofrolled to verify its condition.

Aggregate base course stone should be compacted to at least 98 percent of its maximum dry density as determined by AASHTO T-180 (modified Proctor). Asphalt shall be placed with appropriate lift thicknesses and achieve the proper compaction for the mix(es) used, as specified in the latest edition of the NCDOT QMS for Asphalt Pavements.

The pavement sections provided herein do not account for construction traffic (dump trucks, concrete trucks, Lulls, etc.), which is typically very heavy. If construction traffic is allowed to operate on paved surfaces, damage should be expected. Operating construction equipment on an early placement of base/intermediate course, and then placing a final surface lift at the end of construction, is not an appropriate approach unless the pavement is designed accordingly. In light of this, we recommend that paving operations be scheduled for the end of construction when heavy construction traffic will be less.

APPENDIX A

SITE VICINITY MAP
BORING LOCATION DIAGRAM
HISTORIC SANBORN MAPS



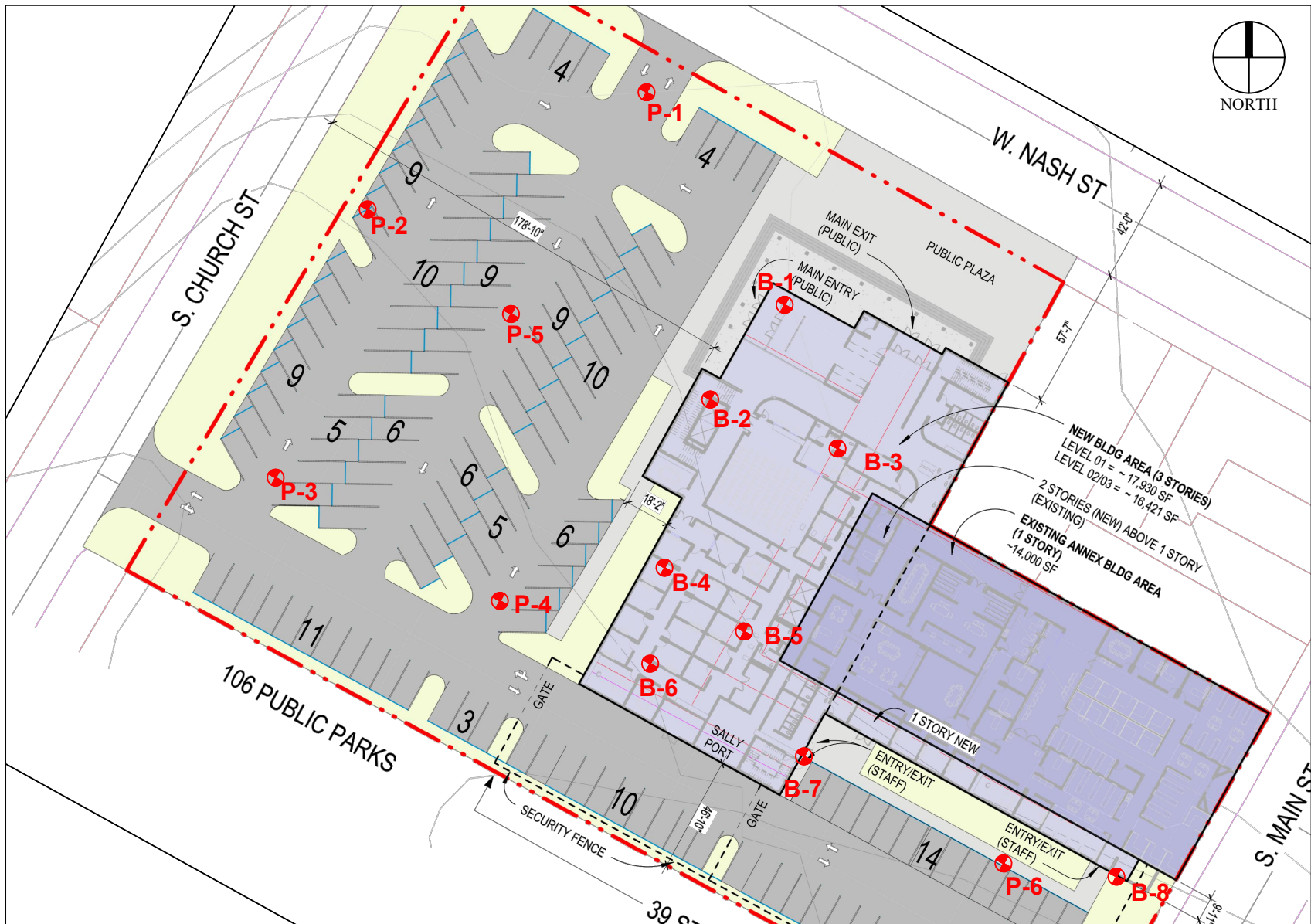
©2022: All documents including computer files and drawings prepared by Stewart are instruments of professional service intended for one-time use. They are subject to copyright and other property right laws and shall remain the property of Stewart. They are not to be copied, modified, or changed in any manner whatsoever nor assigned to a third party without prior written permission of Stewart.

Note: All test locations are approximate (unless otherwise reported) and intended for illustration purposes only.



SITE VICINITY MAP
FRANKLIN CO. JUDICIAL CENTER
 111 West Nash Street
 Louisburg, NC

Project No.: F22034.00	Figure No.:
Scale: 1 in = 100 ft	A1
Prepared by: HH	
Date: 11-02-22	



©2022: All documents including computer files and drawings prepared by Stewart are instruments of professional service intended for one-time use. They are subject to copyright and other property right laws and shall remain the property of Stewart. They are not to be copied, modified, or changed in any manner whatsoever nor assigned to a third party without prior written permission of Stewart.

Note: All test locations are approximate (unless otherwise reported) and intended for illustration purposes only.



SITE VICINITY MAP
FRANKLIN CO. JUDICIAL CENTER
 111 West Nash Street
 Louisburg, NC

Project No.: F22034.00

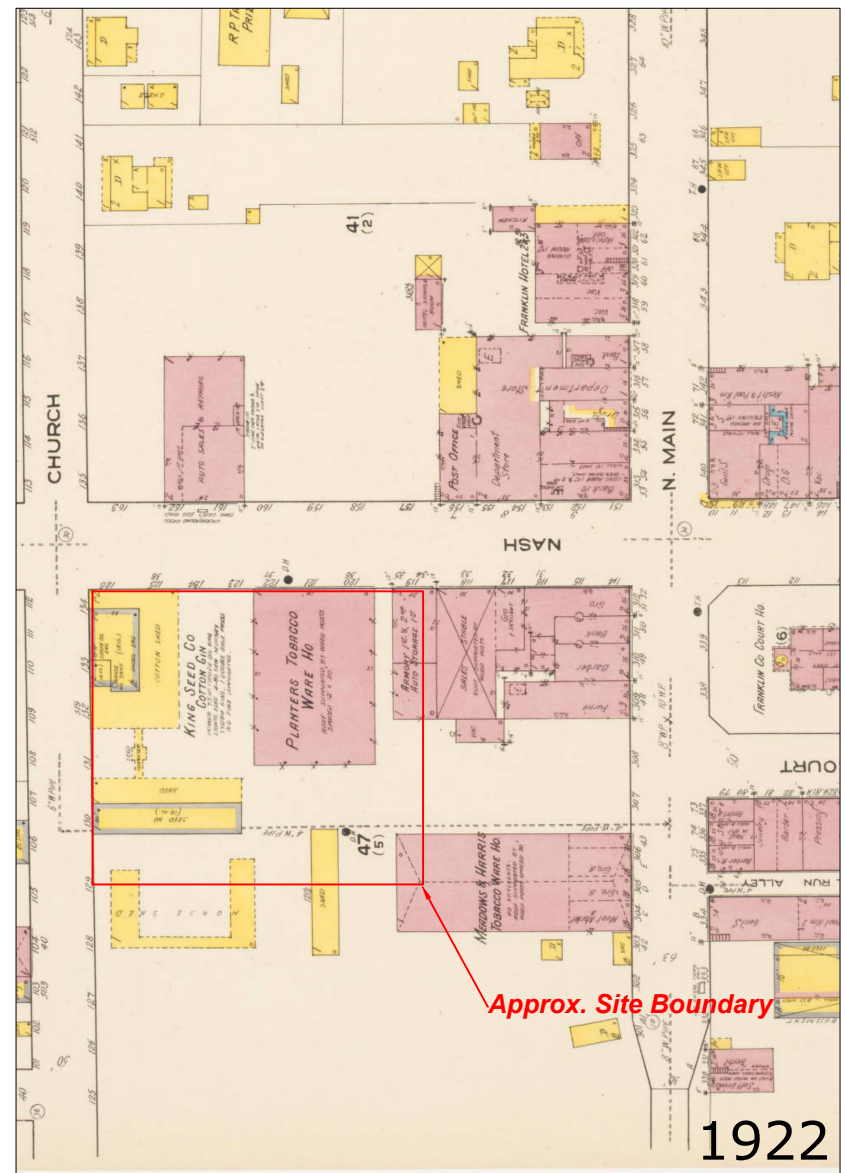
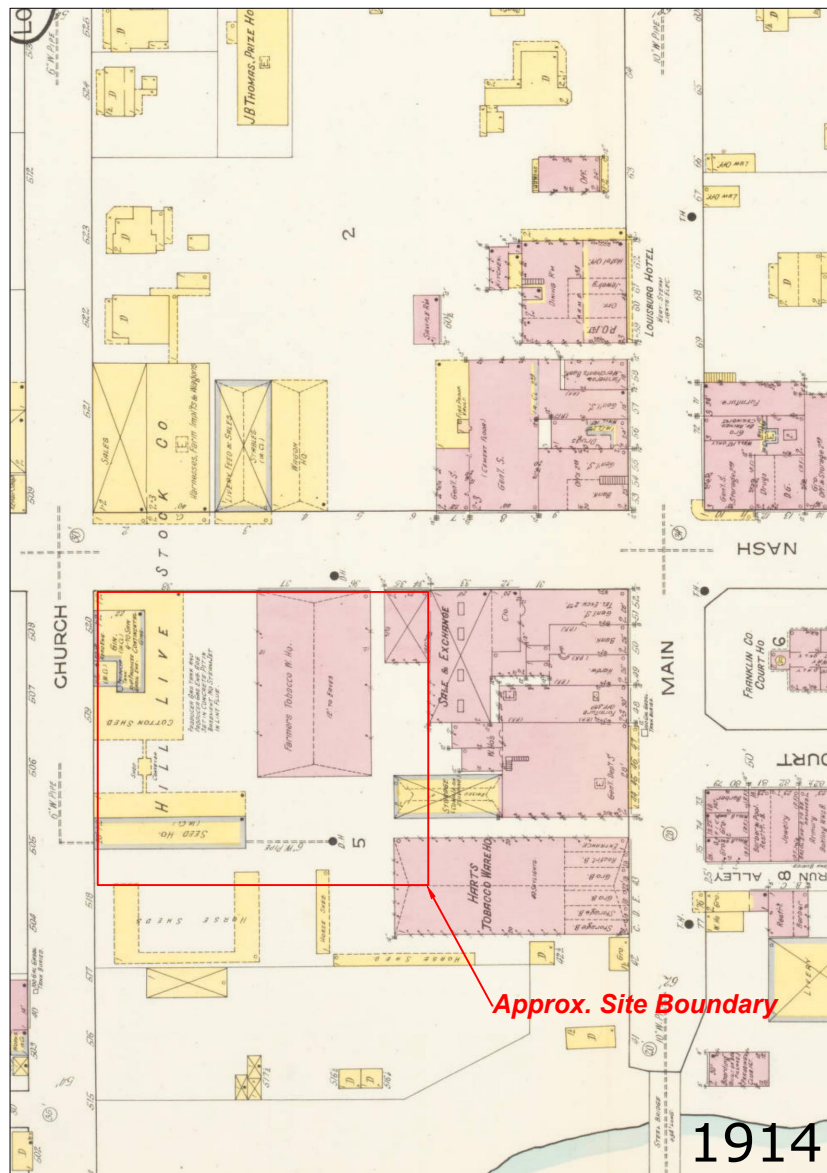
Scale: 1 in = 60 ft

Prepared by: HH

Date: 11-02-22

Figure No.:

A2



©2022: All documents including computer files and drawings prepared by Stewart are instruments of professional service intended for one-time use. They are subject to copyright and other property right laws and shall remain the property of Stewart. They are not to be copied, modified, or changed in any manner whatsoever nor assigned to a third party without prior written permission of Stewart.

Note: All test locations are approximate (unless otherwise reported) and intended for illustration purposes only.



HISTORIC SANBORN MAPS
FRANKLIN CO. JUDICIAL CENTER
 111 West Nash Street
 Louisburg, NC

Project No.:	F22034.00
Scale:	NTS
Prepared by:	DB
Date:	11-04-22

Figure No.:

A3

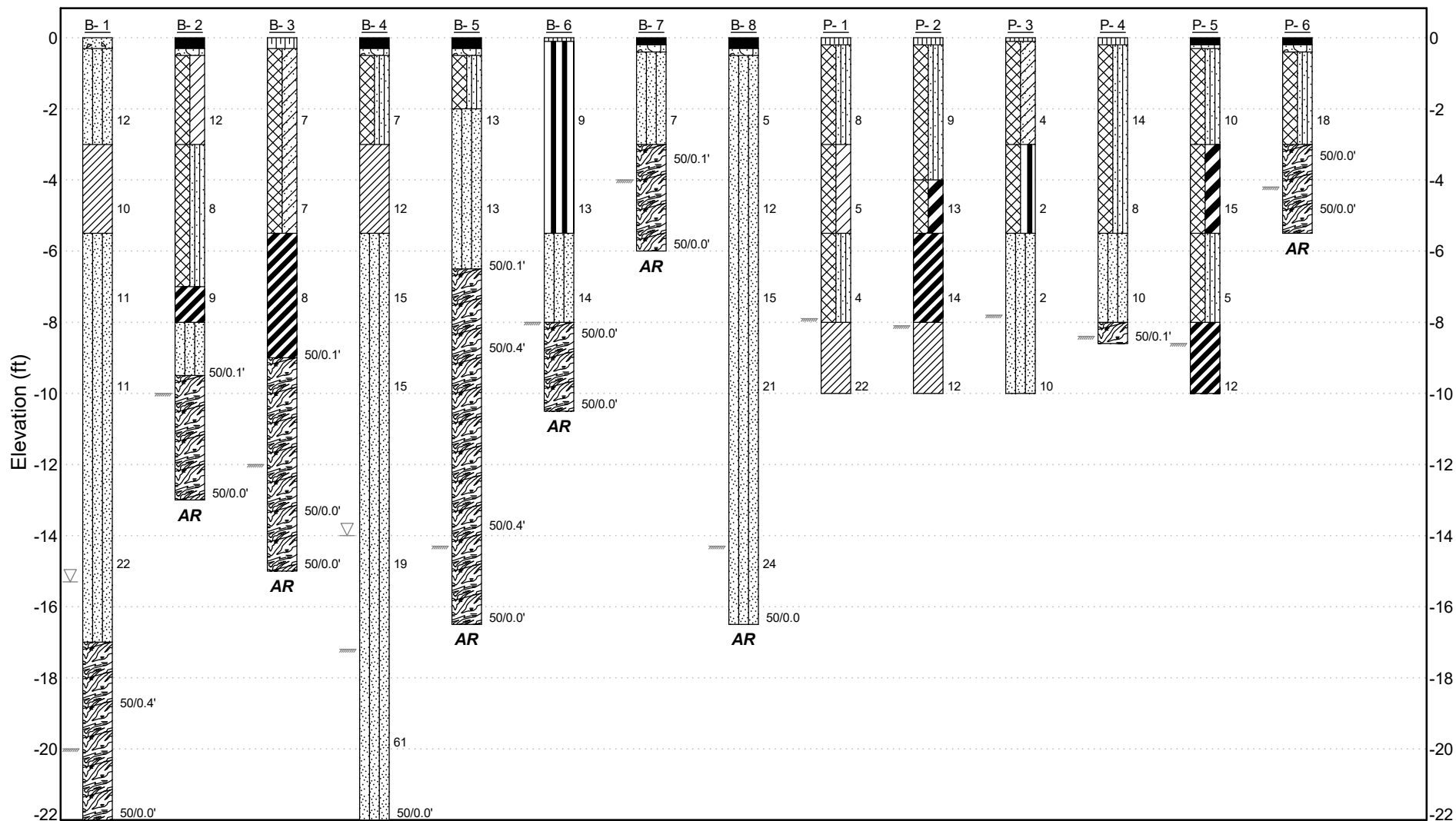
APPENDIX B

BORING SNAPSHOT
BORING SUMMARY TABLE
BORING LOGS
LEGEND TO SOIL DESCRIPTIONS



STEWART

BORING SNAPSHOT



The borings in this snapshot are arranged in alphabetical order and do not represent a profile or cross section of the subsurface conditions.

LITHOLOGY GRAPHICS

Concrete	Silty Sand (SM)	Lean Clay (CL)	Weathered Rock (VWR)	Asphalt
Stone base	Fill - Lean Clay (CL)	Fill - Silty Sand (SM)	Fat Clay (CH)	Topsoil / Organic Layer
Fill - Clayey Sand (SC)	Elastic Silt (MH)	Fill - Fat Clay (CH)	Fill - Elastic Silt (MH)	

FRANKLIN COUNTY JUDICIAL CENTER
LOUISBURG, NC

PROJECT NO.: F22034.00



STEWART

BORING SUMMARY TABLE

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

Borehole ID	Date Completed	Ground Surface El. (ft)	Boring Depth (ft)	GW at 0 Hr		GW after Stabilization		Weathered Rock		Rock/Refusal	
				Depth (ft)	El. (ft)	Depth (ft)	El. (ft)	Depth (ft)	El. (ft)	Depth (ft)	El. (ft)
B- 1	10/20/2022		22	15.3				17		22	
B- 2	10/19/2022		13	DRY				9.5		13	
B- 3	10/19/2022		15	DRY				9		15	
B- 4	10/19/2022		22	14						22	
B- 5	10/20/2022		16.5	DRY				6.5		16.5	
B- 6	10/19/2022		10.5	DRY				8		10.5	
B- 7	10/20/2022		6	DRY				3		6	
B- 8	10/20/2022		16.5	DRY						16.5	
P- 1	10/19/2022		10	DRY							
P- 2	10/19/2022		10	DRY							
P- 3	10/19/2022		10	DRY							
P- 4	10/19/2022		8.6	DRY				8			
P- 5	10/19/2022		10	DRY							
P- 6	10/20/2022		5.5	DRY				3		5.5	

Note: Blank cells indicate not encountered or not measured/recorded. Refer to the individual boring log and report for additional details



STEWART

BORING LOG: B-1

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/20/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 22 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW 15.3 FT 0 HR CAVE-IN 20 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)										
								10 20 30 40 50 60 70 80 90										
								PL ● WC LL										
								□ FINES CONTENT (%)										
0.3		CONCRETE (3 INCHES)																
SM		RESIDUAL MEDIUM DENSE, TAN, MOIST, SILTY SAND			1 SS 1	4 5 7	12											
3.0		STIFF, TAN, MOIST, SANDY LEAN CLAY			2.5 SS 1													
CL					3.5 SS 2	5 5 5	10											
5.5		MEDIUM DENSE, TAN AND GRAY, MOIST, SILTY SAND			5 SS 2													
					6 SS 3	5 4 7	11											
					7.5 SS 3													
		WET BELOW ~8 FEET			8.5 SS 4	3 5 6	11											
					10 SS 4													
	SM																	
					13.5 SS 5	7 10 12	22											
					15 SS 5													
17.0		WEATHERED ROCK TAN AND ORANGE, GRANITE-SAMPLED AS SILTY SAND			18.5 SS 6	50/0.4'	50/0.4'											
	WR				18.9 SS 6													
22.0		AUGER REFUSAL			22 SS 7	50/0.0'	50/0.0'											

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: B-2

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 13 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 10 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)										
								10 20 30 40 50 60 70 80 90										
								PL ● WC LL										
								□ FINES CONTENT (%)										
0.3		ASPHALT (3 INCHES)																
0.5		STONE BASE (2 INCHES)																
CL		FILL			1	11	12											
		STIFF, GRAY, MOIST, SANDY LEAN CLAY			2.5	7												
		WITH GRAVEL				5												
3.0		LOOSE, TAN-RED AND GRAY, MOIST, SILTY SAND			3.5	6	8											
	SM				5	4												
					6	4												
7.0					SS 3	4	9											
	CH	RESIDUAL			7.5	6												
8.0		STIFF, GRAY, MOIST, SANDY FAT CLAY																
	SM	STIFF, TAN AND DARK BROWN, WET, SILTY SAND			8.5	7												
9.5					SS 4	9												
		WEATHERED ROCK			9.6	50/0.1	50/0.1											
		TAN, GRANITE-SAMPLED AS SILTY SAND																
	WR																	
13.0		AUGER REFUSAL			13	50/0.0	50/0.0											
					SS 5													

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 **LOGGED BY** H. HANCOCK

GROUND SURFACE EL. _____ BORING DEPTH 15 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 12 FT

DRILLING METHOD HSA **AUGER SIZE** 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 **HAMMER TYPE** MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																	
								10 20 30 40 50 60 70 80 90 PL ● WC LL 10 20 30 40 50 60 70 80 90																	
								□ FINES CONTENT (%)																	
								10 20 30 40 50 60 70 80 90																	
0.3		TOPSOIL																							
		FILL LOOSE, TAN AND GRAY, WET, CLAYEY SAND WITH TRACE ORGANICS			1 2.5 SS 1	3 4 3	7																		
	SC	SATURATED BELOW ~3 FEET																							
5.5		RESIDUAL MEDIUM STIFF, GRAY, WET, SANDY FAT CLAY			3.5 5 SS 2	2 3 4	7																		
	CH																								
9.0		WEATHERED ROCK TAN AND GRAY, GRANITE-SAMPLED AS SILTY SAND			6 7.5 SS 3	4 4 4	8																		
	WR				8.5 9.1 SS 4	10 50/0.1'	50/0.1'																		
					13.5 SS 5	50/0.0'	50/0.0'																		
15.0		AUGER REFUSAL			15 SS 6	50/0.0'	50/0.0'																		



STEWART

BORING LOG: B-4

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 22 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW 14 FT 0 HR CAVE-IN 17.2 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)										
								10 20 30 40 50 60 70 80 90										
								PL ● WC LL										
								10 20 30 40 50 60 70 80 90										
								☐ FINES CONTENT (%)										
								10 20 30 40 50 60 70 80 90										
0.3		ASPHALT (3 INCHES)																
0.5		STONE BASE (2 INCHES)																
	SM	FILL LOOSE, DARK BROWN, MOIST, SILTY SAND			1 2.5	4 4 3	7											
3.0																		
	CL	RESIDUAL STIFF, TAN-ORANGE, MOIST, SANDY LEAN CLAY WITH TRACE ROOTS			3.5 5	4 5 7	12											
5.5																		
		MEDIUM DENSE TO VERY DENSE, TAN-ORANGE, MOIST TO WET, SILTY SAND WITH WEATHERED ROCK FRAGMENTS			6 7.5	6 6 9	15											
		<i>WET BELOW ~8 FEET</i>			8.5 10	5 7 8	15											
	SM				13.5 15	6 8 11	19											
					18.5 20	21 25 36	61											
22.0																		
		AUGER REFUSAL			22	50/0.0'	50/0.0'											
					SS 7													

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: B- 5

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/20/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 16.5 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 14.3 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																	
								10 20 30 40 50 60 70 80 90																	
								PL ● WC LL																	
								10 20 30 40 50 60 70 80 90																	
								☐ FINES CONTENT (%)								10 20 30 40 50 60 70 80 90									
								10 20 30 40 50 60 70 80 90																	
0.3		ASPHALT (3 INCHES)																							
0.5		STONE BASE (2 INCHES)																							
2.0	SM	FILL MEDIUM DENSE, RED AND BLACK, MOIST, SILTY SAND WITH ASPHALT AND TERRACOTTA FRAGMENTS			1 SS 1	5 6 7																			
		RESIDUAL MEDIUM DENSE, ORANGE, MOIST, SILTY SAND WITH TRACE MICA			2.5 SS 1	7	13																		
	SM				3.5 SS 2	6 6 7																			
					5 SS 2	7	13																		
6.5					6 SS 3	12																			
		WEATHERED ROCK TAN AND GRAY, GRANITE-SAMPLED AS SILTY SAND			6.6 SS 3	50/0.1'	50/0.1'																		
					8.5 SS 4	50/0.4'	50/0.4'																		
					8.9 SS 4																				
	WR				13.5 SS 5	50/0.4'	50/0.4'																		
					13.9 SS 5																				
16.5					16.5 SS 6	50/0.0'	50/0.0'																		
		AUGER REFUSAL																							

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: B- 6

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 10.5 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 8 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)										
								10 20 30 40 50 60 70 80 90										
								PL ● WC LL										
								10 20 30 40 50 60 70 80 90										
								□ FINES CONTENT (%)										
								10 20 30 40 50 60 70 80 90										
0.1		TOPSOIL																
		RESIDUAL																
		STIFF, RED-BROWN AND GRAY, MOIST, CLAYEY SILT			1	4	9											
	MH				2.5	5												
					3.5	7												
					5	6	13											
5.5		MEDIUM DENSE, ORANGE AND BROWN, WET, SILTY SAND			6	7												
	SM				7.5	7	14											
8.0																		
		WEATHERED ROCK			8.5	50/0.0'	50/0.0'											
		TAN AND ORANGE GRANITE - SAMPLED AS SILTY SAND																
	WR																	
10.5					10.5	50/0.0'	50/0.0'											
		AUGER REFUSAL																

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: B-7

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/20/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 6 FT


DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 4 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								10 20 30 40 50 60 70 80 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								PL ● WC LL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								10 20 30 40 50 60 70 80 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								□ FINES CONTENT (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								10 20 30 40 50 60 70 80 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
0.2		ASPHALT (2 INCHES)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



PAGE 1 OF 1

PROJECT NO. F22034.00

0 HR GW DRY 0 HR CAVE-IN 14.3 FT

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: P- 1

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 10 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 7.9 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE		SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																		
					DEPTH (ft)	TYPE			PL ● WC LL																		
									10 20 30 40 50 60 70 80 90																		
									□ FINES CONTENT (%)																		
10 20 30 40 50 60 70 80 90																											
0.2		TOPSOIL																									
	SM	FILL LOOSE, BROWN, MOIST, SILTY SAND WITH TRACE ROCK FRAGMENTS			1	SS 1	3 4 4	8	▲																		
3.0		MEDIUM STIFF, TAN-GRAY, WET, SANDY LEAN CLAY			2.5																						
	CL				3.5	SS 2	3 2 3	5	▲																		
5.5		LOOSE, GRAY, WET, SILTY SAND			5																						
	SM				6	SS 3	3 2 2	4	▲																		
8.0		RESIDUAL VERY STIFF, GRAY, MOIST, LEAN CLAY			7.5																						
	CL				8.5	SS 4	7 9 13	22	▲																		
10.0					10																						

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



PAGE 1 OF 1

PROJECT NO. F22034.00

0 HR GW DRY 0 HR CAVE-IN 8.1 FT

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

BORING TERMINATED

BORING TERMINATED



STEWART

BORING LOG: P- 3

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 10 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 7.8 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																	
								10 20 30 40 50 60 70 80 90																	
								PL ● WC LL																	
								10 20 30 40 50 60 70 80 90																	
								☐ FINES CONTENT (%)																	
10 20 30 40 50 60 70 80 90																									
0.1		TOPSOIL																							
	SC	FILL LOOSE, TAN AND ORANGE, MOIST, CLAYEY SAND WITH TRACE TERRACOTTA FRAGMENTS			1 SS 1	3 2 2	4																		
3.0					2.5																				
	MH	SOFT, TAN AND RED, WET, CLAYEY SILT WITH POSS. COAL FRAGMENTS			3.5 SS 2	2 1 1	2																		
5.5					5																				
		RESIDUAL VERY LOOSE TO MEDIUM DENSE, ORANGE AND GRAY, SATURATED, SILTY SAND			6 SS 3	1 1 1	2																		
	SM				7.5																				
10.0					8.5 SS 4	3 4 6	10																		
					10																				

BORING TERMINATED



STEWART

BORING LOG: P-4

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 8.6 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 8.4 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE		SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
					DEPTH (ft)	TYPE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
									ID NUMBER	PL ● WC LL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
										10 20 30 40 50 60 70 80 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
										☐ FINES CONTENT (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
										10 20 30 40 50 60 70 80 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
0.2		TOPSOIL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: P- 5

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/19/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 10 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 8.6 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE		SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)											
					DEPTH (ft)	TYPE			ID NUMBER	10 20 30 40 50 60 70 80 90										
										PL ● WC LL										
										10 20 30 40 50 60 70 80 90										
□ FINES CONTENT (%)																				
10 20 30 40 50 60 70 80 90																				
0.2		ASPHALT (2 INCHES)																		
0.3		STONE BASE (3 INCHES)																		
	SM	<u>FILL</u> MEDIUM DENSE, TAN, MOIST, SILTY SAND WITH TRACE ROCK FRAGMENTS			1	SS 1	8 6 4	10												
3.0		STIFF, TAN-BROWN, MOIST, SANDY FAT CLAY			2.5															
	CH				3.5	SS 2	7 7 8	15												
5.5		LOOSE, DARK BROWN, MOIST, SILTY SAND			5															
	SM				6	SS 3	4 3 2	5												
8.0					7.5															
	CH	<u>RESIDUAL</u> STIFF, GRAY, WET, SANDY FAT CLAY			8.5	SS 4	3 5 7	12												
10.0					10															

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.



STEWART

BORING LOG: P- 6

PAGE 1 OF 1

PROJECT FRANKLIN COUNTY JUDICIAL CENTER

CLIENT OAKLEY COLLIER ARCHITECTS

LOCATION LOUISBURG, NC

PROJECT NO. F22034.00

DATE DRILLED 10/20/22 LOGGED BY H. HANCOCK

GROUND SURFACE EL. BORING DEPTH 5.5 FT

DRILLING CONTRACTOR J&L DRILLING

0 HR GW DRY 0 HR CAVE-IN 4.2 FT

DRILLING METHOD HSA AUGER SIZE 2-1/4 INCH (ID)

BOREHOLE BACKFILLED IMMEDIATELY AFTER DRILLING

DRILL RIG CME 75 HAMMER TYPE MANUAL

DEPTH (ft)	MATERIAL TYPE	MATERIAL DESCRIPTION	ELEVATION (ft)	WL / CAVE EL (ft)	SAMPLE DEPTH (ft) TYPE ID NUMBER	SPT BLOW COUNTS	N-VALUE (bpf)	▲ SPT N-VALUE (BPF)										
								10 20 30 40 50 60 70 80 90										
								PL ● WC LL										
								10 20 30 40 50 60 70 80 90										
								□ FINES CONTENT (%)										
								10 20 30 40 50 60 70 80 90										
0.2	SM	ASPHALT (2 INCHES)																
0.4		STONE BASE (3 INCHES)																
		FILL			1	8												
		MEDIUM DENSE, BROWN, MOIST, SILTY SAND WITH ROCK FRAGMENTS			2.5	10												
3.0		WEATHERED ROCK																
	WR	TAN GRANITE-SAMPLED AS SILTY SAND			3.5	50/0.0'	50/0.0'											
5.5		AUGER REFUSAL			5	50/0.0'	50/0.0'											

Note: SPT Blow Counts are per 6 inches of penetration unless otherwise noted.

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND	
COARSE-GRAINED SOILS > 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL	
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL	
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL	
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL	
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND	
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND	
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND	
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND	
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LOW PLASTICITY (LEAN) CLAY	
			PI>4 AND PLOTS<"A" LINE	ML	LOW PLASTICITY SILT	
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT	
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	HIGH PLASTICITY (FAT) CLAY	
			PI PLOTS <"A" LINE	MH	HIGH ELASTICITY SILT	
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT	
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT	

MATERIAL TYPES ENCOUNTERED ONSITE

	Asphalt		Fat Clay (CH)
	Lean Clay (CL)		Concrete
	Fill - Fat Clay (CH)		Fill - Lean Clay (CL)
	Fill - Elastic Silt (MH)		Fill - Clayey Sand (SC)
	Fill - Silty Sand (SM)		Elastic Silt (MH)
	Silty Sand (SM)		Stone base
	Topsoil / Organic Layer		Weathered Rock (WR)

PENETRATION RESISTANCE

(RECORDED AS BLOWS PER 6 IN.)

SAND & GRAVEL		SILT & CLAY	
DENSITY	BLOWS/FT*	CONSISTENCY	BLOWS/FT*
VERY LOOSE	0 - 3	VERY SOFT	0 - 1
LOOSE	4 - 9	SOFT	2 - 4
MEDIUM DENSE	10 - 30	MEDIUM STIFF (FIRM)	5 - 8
DENSE	31 - 50	STIFF	9 - 15
VERY DENSE	51+	VERY STIFF	16 - 30
		HARD	31+

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

SAMPLE TYPES FOR THIS EXPLORATION

☒ SPLIT SPOON

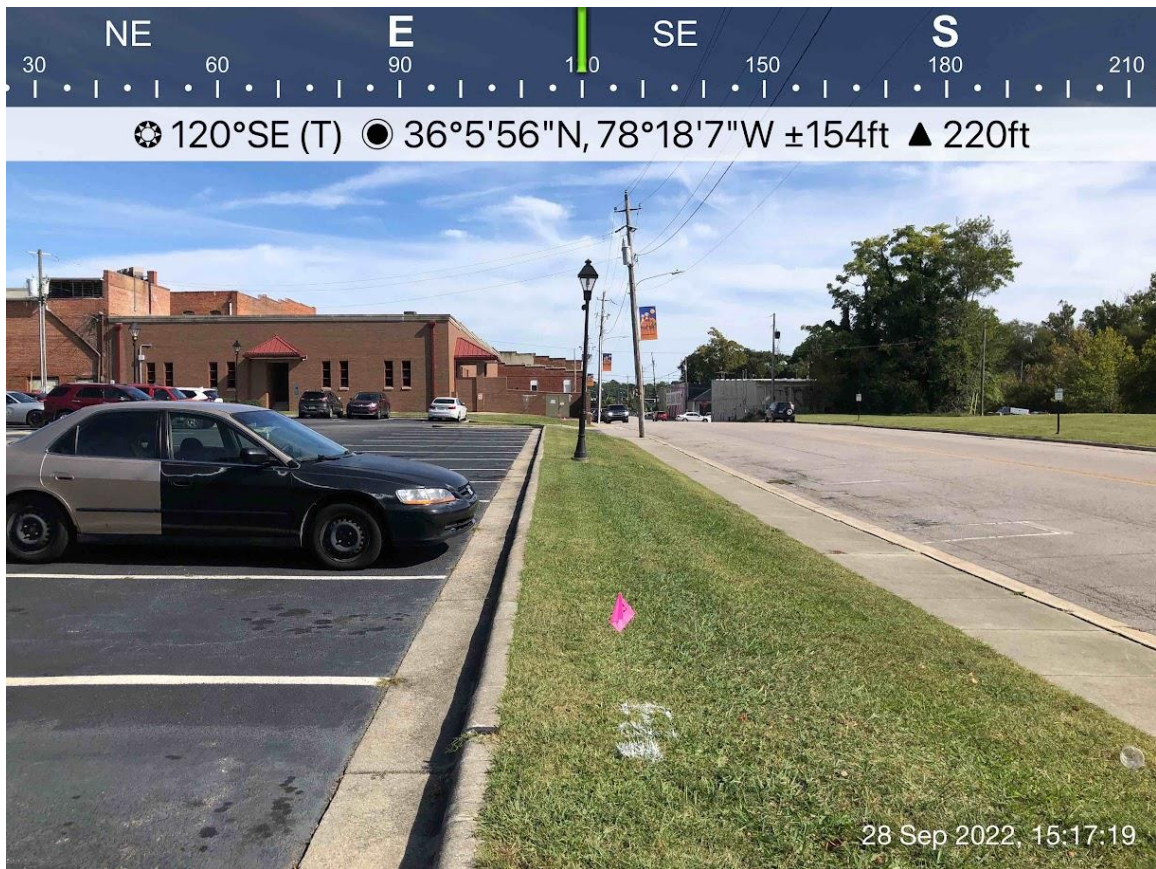
ADDITIONAL ABBREVIATIONS, TERMINOLOGY, & SYMBOLS

HSA - HOLLOW-STEM AUGER	EOD - END OF DAY
HA - HAND AUGER	FIAD - FILLED IMMEDIATELY AFTER DRILLING/DIGGING
SPT - STANDARD PENETRATION TEST	DRY - REQUIRES WETTING TO REACH OPTIMUM
BPF - BLOWS PER FOOT	MOIST - AT OR NEAR OPTIMUM
PL - PLASTIC LIMIT	WET - REQUIRES DRYING TO REACH OPTIMUM
LL - LIQUID LIMIT	SAT - SATURATED, EXCESSIVELY WET (FREE WATER)
MC - MOISTURE CONTENT	▽ - WATER LEVEL AT TIME OF DRILLING
SS - SPLIT SPOON	▼ - WATER LEVEL AFTER DRILLING
AP - AUGER PROBE	//// - CAVE-IN LEVEL
WL - WATER LEVEL	
USCS - UNIFIED SOIL CLASSIFICATION SYSTEM	
WOH - WEIGHT OF HAMMER	
WOR - WEIGHT OF RODS	

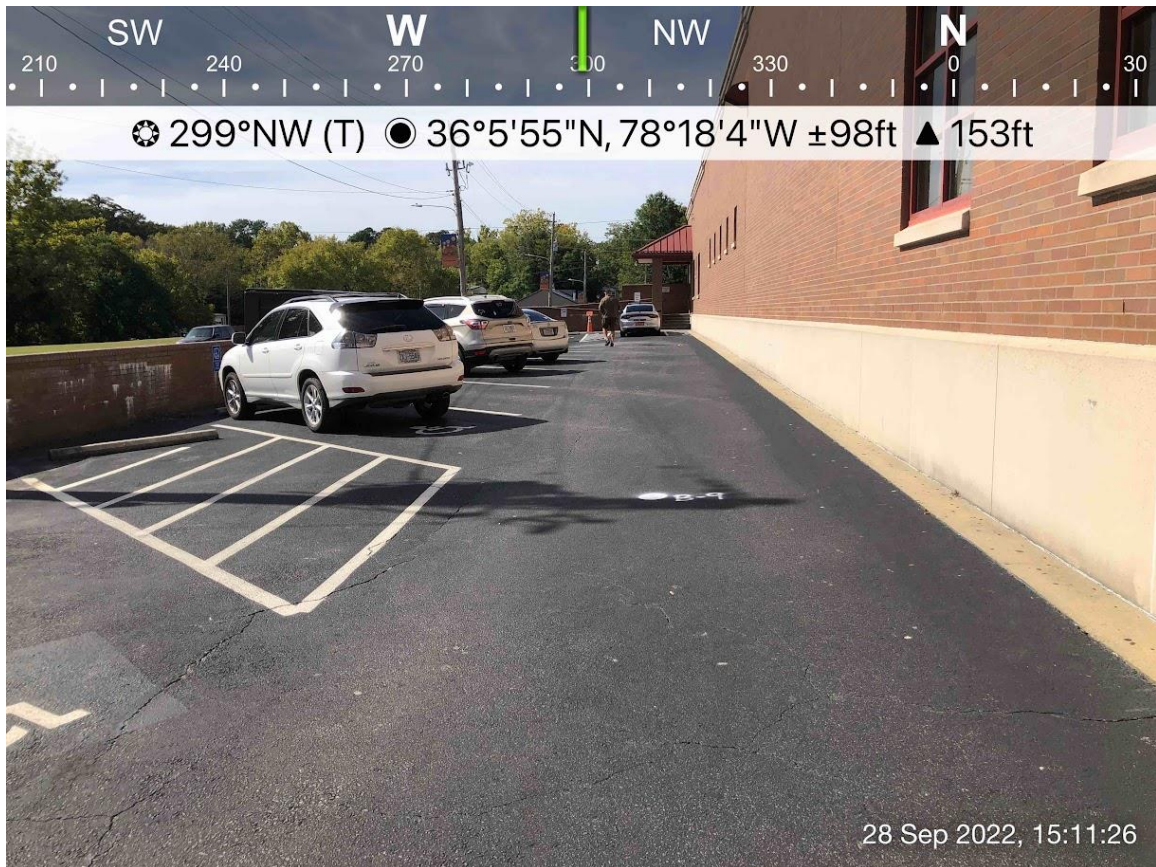
APPENDIX C

SITE PHOTOGRAPHS

SITE PHOTOGRAPHS

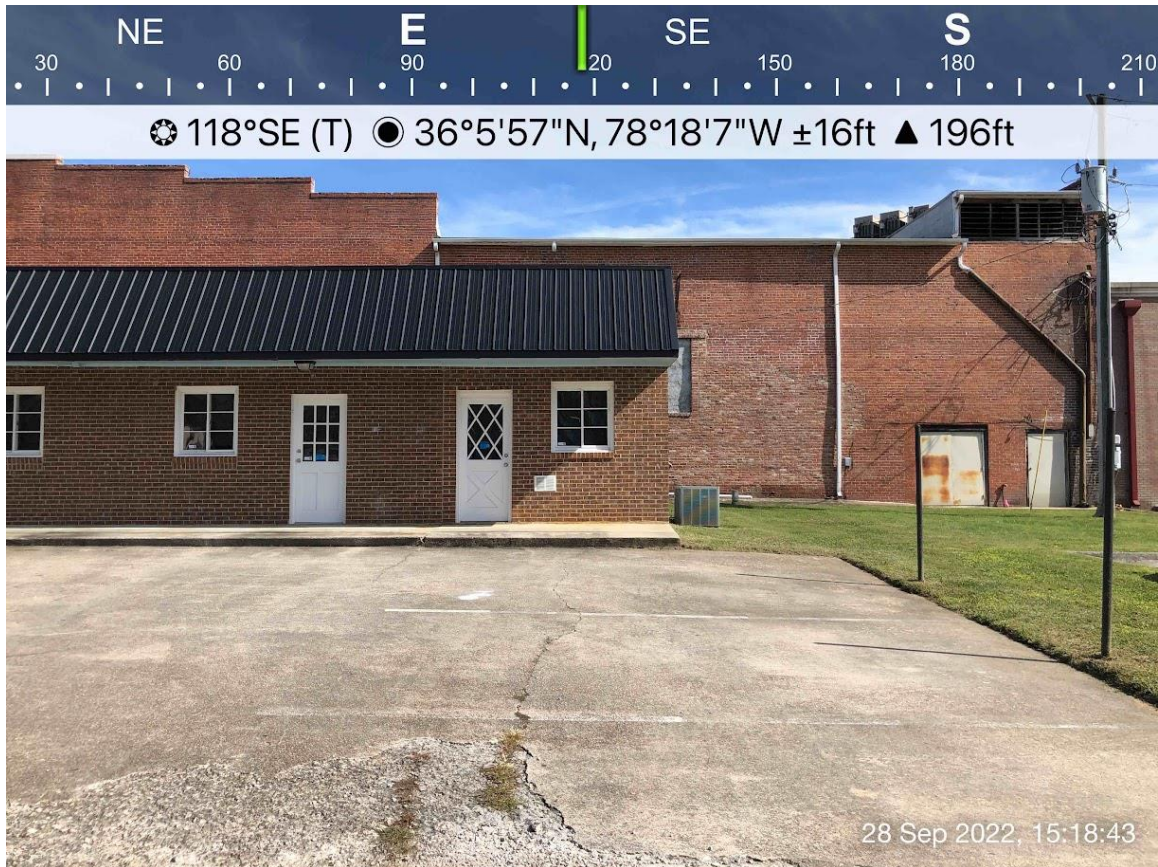


Photograph 1: Looking southeast on W Johnson St.

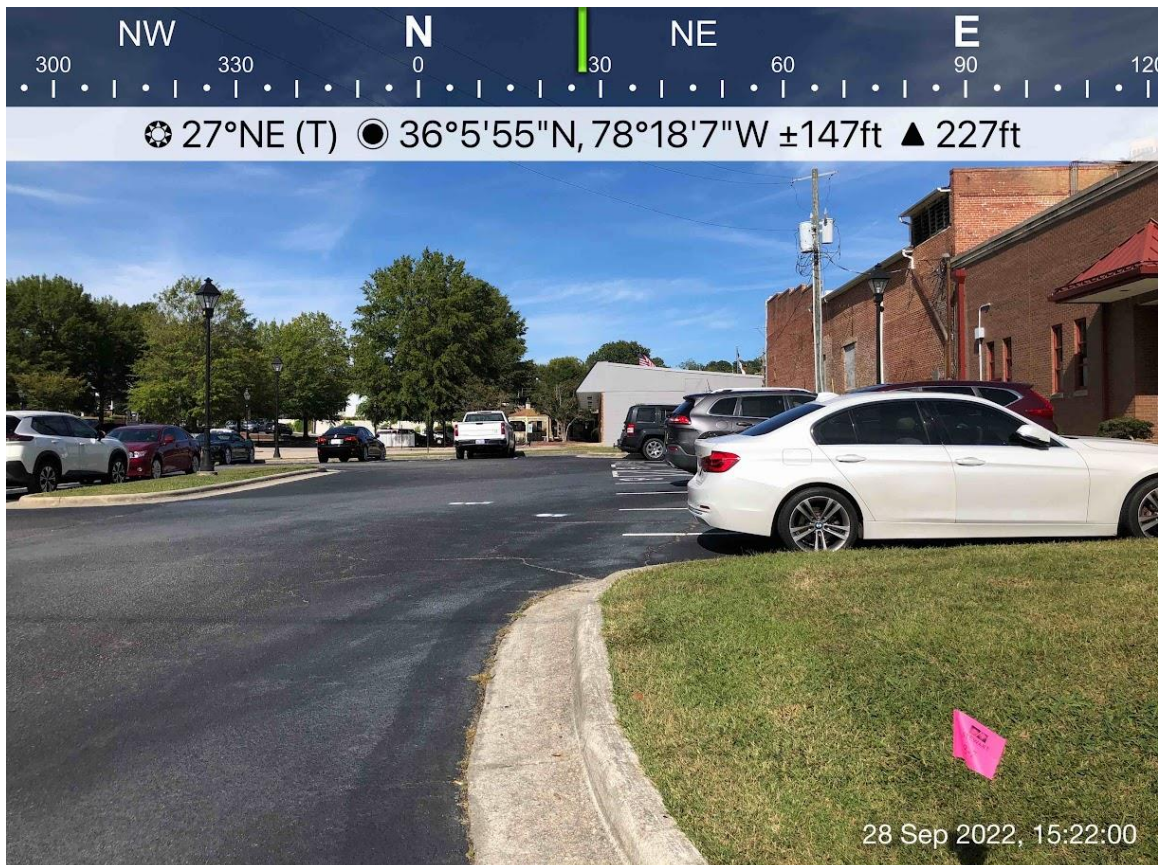


Photograph 2: Looking northwest from S Main St, towards from P-6.

SITE PHOTOGRAPHS



Photograph 3: Existing concrete parking lot.



Photograph 4: Looking north towards B-6 from W Johnson St.

GEOTECHNICAL ADDENDUM NO. 2

April 19, 2024

Oakley Collier Architects
109 Candlewood Road
Rocky Mount, NC 27804

Re: **Franklin County Judicial Center**
111 W. Nash Street
Louisburg, NC
Foundation Bearing Capacity

Based on the latest foundation plan provided by EM Structural, we understand that the column loads generally range from 20 kips up to 565 kips. The upper end of this load range is higher than the preliminary loads available at the time of the original Geotechnical Engineering Report prepared by Stewart (dated November 4, 2022). As such, we have re-evaluated the available soil bearing capacity and settlement potential with these new loads.

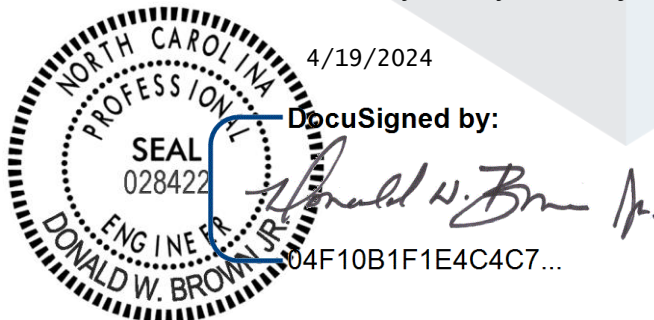
Based on the new loading provided, we recommend increasing the net allowable soil bearing capacity to 2,500 psf. With this increase, we estimated that the total and differential settlements will still be equal to or less than 1 inch and ½ inch, respectfully. The remainder of the foundation design parameters noted in the aforementioned report still apply.

We appreciate being of continued service to you, the County, and the rest of the design team on this project. If you have any questions, please feel free to contact me at your convenience.

Sincerely,

SOUTHERN ENGINEERING AND TESTING, P.C.

NC License No. C-4167; SC Certificate of Authority 5297



Donald W. Brown Jr, PE
Vice President | Principal

This page intentionally left blank



**SOUTHERN
ENGINEERING**

Consulting | Testing | Special Inspections

- 📍 5400 Old Poole Road
Raleigh, NC 27610
- ☎ (919) 321-9407
- 🌐 www.southernengineeringpc.com



SE&T PROJECT NO.: 25-1220 | August 27, 2025

Report of Subsurface Exploration & Geotechnical Engineering Evaluation

Franklin Co. Judicial Center Parking Lot | Louisburg, North Carolina

PREPARED FOR:

Oakley Collier Architects
205 W. Martin Street
Raleigh, NC 27604

August 27, 2025

Mr. Joeseph Klimek, RA
Oakley Collier Architects
205 W. Martin Street
Raleigh, NC 27604

**Report of Subsurface Exploration
and Geotechnical Engineering Evaluation**
Franklin Co. Judicial Center Parking Lot
W. Johnson Street
Louisburg, North Carolina
SE&T Project No.: 25-1220

Dear Joseph,

Southern Engineering and Testing, P.C. (SE&T) has completed the geotechnical engineering evaluation for the project referenced above. This report describes the field exploration and presents the results of our engineering evaluation along with geotechnical related design and construction recommendations for this project.



We appreciate the opportunity to work with you during the design phase of this project.

Sincerely,

SOUTHERN ENGINEERING AND TESTING, P.C.

NC License No. C-4167; SC Certificate of Authorization 5297

8/27/2025



Donald W. Brown Jr, PE
Vice President | Principal

TABLE OF CONTENTS

1	OBJECTIVE AND AUTHORIZATION.....	1
2	PROJECT UNDERSTANDING	1
3	SITE INFORMATION	1
	3.1 Site Location and Description.....	1
	3.2 Local Geology.....	2
4	FIELD AND LABORATORY SERVICES	3
	4.1 Subsurface Exploration.....	3
	4.2 Laboratory Services.....	3
5	SUBSURFACE CONDITIONS	3
	5.1 Surficial Soils	4
	5.2 Fill Soils	4
	5.3 Residuum	4
	5.4 Groundwater.....	4
6	ENGINEERING ASSESSMENT AND RECOMMENDATIONS.....	4
	6.1 Site Grading.....	5
	6.2 Pavement	6
7	LIMITATIONS OF THE REPORT	8

Appendix A

Site Vicinity Map
Subsurface Exploration Plan
Historic Sanborn Map (1914)

Appendix B

Subsurface Diagram
Boring Logs
Legend to Soil Descriptions

Appendix C

Site Photographs

Appendix D

GBA Circular

1 OBJECTIVE AND AUTHORIZATION

The primary objective of our services was to evaluate the subsurface conditions within the area of planned construction and to make geotechnical engineering recommendations for site development, including recommendations for pavement design. The scope for the geotechnical engineering services discussed in this report was outlined in SE&T Proposal No.: 25-31862 dated August 11, 2025.

2 PROJECT UNDERSTANDING

To prepare this report, SE&T was provided with the following information:

- Survey Exhibit: Proposed Recombination of Parcels for Franklin County prepared by Bolton & Menk (dated 9/30/24)
- Site Plan (Sheet C-2.00) prepared by Wooten (dated 7/23/25)
- Stormwater plan (snippet) prepared by Wooten (no date)

The project will consist of a new asphalt parking lot in an area that is currently occupied by W. Johnson Street and "Lot 1" on the south side of W. Johnson Street. The available grading plans indicate that grading will require cutting Lot 1 by 2 to 3 feet to allow transition from the existing W. Johnson Street grades. The provided information also indicates that a 72-inch corrugate metal pipe (CMP) underground stormwater detention device will be installed in the northwestern portion of the site. The CMP will be "L" shaped and have an invert of 199 feet. This is expected to require excavating 10 to 13 feet below the current grades

3 SITE INFORMATION

3.1 Site Location and Description

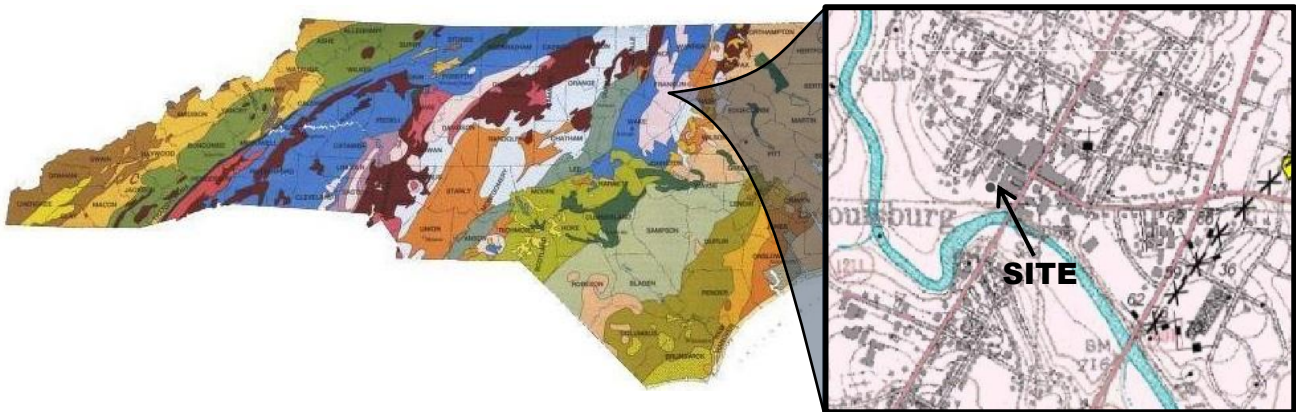
The site encompasses W. Johnson Street and Lot 1 to its south in Louisburg, North Carolina. Please see Figure A1 in [Appendix A](#) for a site vicinity map. At the time of our site visit, the subject site was a grass-covered, rectangular lot with numerous exposed rock outcrops at the ground surface (see [Photographs #1](#) through [#3](#)). The ground surface across the site is generally flat with a gentle downward slope from north to south. According to ground surface elevations on the provided civil drawings, there is approximately 8 feet of relief across the area of proposed construction.

Beyond the south property line, the ground drops sharply to a Tar River flood plain. Numerous large boulders were observed in the tree line along this southern property boundary (see [Photograph #4](#)).

3.2 Local Geology

The site is located within the Raleigh Belt of the Piedmont Physiographic Province of the eastern United States. The Piedmont is a complex assemblage of igneous (volcanic and plutonic) and sedimentary rocks that were generally formed during the Late Proterozoic Era and the Early Cambrian Period (approximately 550 to 900 million years ago). During and subsequent to formation, these rocks were subjected to several major tectonic events, including plate collisions, folding, faulting, and igneous intrusions, that resulted in the uplift and metamorphism of the preexisting rocks. Tectonic activity generally stopped about 200 to 250 million years ago, and erosional forces have formed the current ground surface.

Review of the *Bedrock Geologic Map of the Louisburg 7.5-minute Quadrangle, Franklin County, North Carolina (2010)* indicates that the subject site is primarily underlain by granite (PPgd) of the Rolesville batholith.



Residual soils are the result of in-place weathering of the underlying bedrock. Residual soils near the ground surface, which have experienced a higher degree of weathering than deeper material, frequently consist of fine-grained cohesive soils including clayey silt (ML and MH) and silty clay (CL and CH). Chemical weathering of minerals within the parent bedrock such as mica and iron-bearing materials typically produces iron oxides and other compounds which result in predominately orange, yellow, red and brown colored soils. The thickness of this surficial clayey zone is typically in the range of about 3 to 8 feet. For various reasons, such as erosion or local variation of mineralization, the upper clayey zone is not always present or may be thicker.

With increased depth, the soil profile typically becomes less weathered, coarser grained, and the structural character of the underlying parent rock becomes more evident. These residual soils are typically classified as sandy silt (ML) or silty sand (SM). With a further increase in depth the soil eventually becomes harder or denser and takes on an increasing resemblance to the underlying parent rock. When these intact, native materials have a standard penetration resistance of 50 blows or greater per 6 inches of penetration, they are referred to as partially weathered rock (PWR). PWR represents the transition layer between the residual soil and underlying bedrock. The thickness of the PWR may vary from only a few inches to as much as 40 feet or more and may occur at a wide range of depths. Furthermore,

the depth to and thickness of the zone of partially weathered rock and the depth to bedrock have both been found to vary considerably over relatively short distances. Lenses or layers of partially weathered rock underlain by less dense or hard material are not unusual in Piedmont soil profiles. The depth to the surface of bedrock within the Piedmont may frequently range from the ground surface to 80 feet or more.

4 FIELD AND LABORATORY SERVICES

4.1 Subsurface Exploration

The geotechnical exploration included five soil test borings (P-1 through P-5) at the approximate locations illustrated by Figure A2 in [Appendix A](#) of this report. The borings were advanced to approximate depths ranging from 3 to 12 feet below the current ground surface by Southern Engineering with a small, track-mounted TMG MC-37 drill rig. Borings were performed using 2¼-inch (ID) hollow-stem, continuous flight augers in general accordance with ASTM D6151.

Sampling operations were conducted in general accordance with ASTM D1586. At predetermined intervals, soil samples were obtained with a split-barrel sampler (standard 2-inch O.D.). The sampler was rested on the bottom of the borehole and driven to a penetration of 18 inches (or fraction thereof) with blows of a 140-pound automatic drop hammer falling 30 inches. Of the 18 inches, the number of hammer blows required to achieve 6 inches of penetration is recorded for three consecutive segments. The sum of the blow counts for the second and third 6-inch segment is termed the Standard Penetration Test (SPT) resistance, or N-value. The N-values presented on the Subsurface Diagram and Boring Logs are the actual, field-recorded blow counts and do not include correction factors for hammer energy or overburden soil pressures.

4.2 Laboratory Services

The soil samples obtained during the SPT drilling operations were placed in labeled containers and delivered to our Raleigh laboratory where they were visually-manually classified in general accordance with ASTM D2488 and logged by a member of Southern Engineering's geotechnical engineering staff. Typed boring logs are included in [Appendix B](#) of this report. All untested soil samples will be stored for two months before discarding.

5 SUBSURFACE CONDITIONS

The following is a subsurface description of a generalized nature, provided to highlight the major soil strata encountered in the borings. The stratification of the subsurface materials illustrated on the Boring Logs and Boring Snapshot represent the conditions at the actual test locations; therefore, variations should be expected between borings. Stratigraphy boundaries only represent the approximate depth/elevation of a noticed material change

but the transition between material types is typically gradual. The soil types are based on the Unified Soil Classification System (USCS).

The ground surface elevation and coordinates at each boring location were measured by Southern Engineering using a Carlson BRx7 survey-grade GPS unit, unless noted otherwise. These are reported on the Boring Logs in [Appendix B](#) of this report.

5.1 Surficial Soils

A topsoil layer was encountered at the ground surface in four of the five borings. The thickness of the topsoil layer was roughly 2 to 4 inches. Topsoil thickness is rarely uniform and so it should be expected to vary throughout the site. Boring B-3 encountered a 6-inch thick layer of gravel at the ground surface.

5.2 Fill Soils

Fill soils were encountered beneath the topsoil and gravel layers in all five borings. The fill primarily consisted of Silty Sand (SM) with lesser amounts of elastic SILT (MH) and fat CLAY (CH). The fill contained significant amounts of rock. Also, as previously noted, large rocks/boulders were observed at the ground surface across much of the site. Some of the fill also contained coal, slag, and/or glass intermixed within it. Standard penetration test resistance (SPT) "N-values" generally ranged from 0 (weight-of-hammer) to 8 blows per foot (bpf) in fill without significant rock content, which suggests poor compaction. The rock-laden fill exhibited N-values ranging from 15 bpf up to 50 blows with no penetration (i.e., split spoon sampler refusal). All five borings were terminated in fill after encountering auger refusal on buried rock.

5.3 Residuum

Native residual soils were not encountered due to the rock-laden fill.

5.4 Groundwater

Groundwater was not encountered during drilling and was not present after auger removal. The boreholes were backfilled immediately upon completion for safety reasons.

6 ENGINEERING ASSESSMENT AND RECOMMENDATIONS

Due to the condition of the fill below this site, there is a risk for future pavement issues related to long term settlement of the fill mass. To eliminate this risk, complete removal and replacement of the existing fill would be needed. Since the fill appears to be relatively deep, this is not practical for a parking lot. As such, the subgrade preparation recommendations herein are intended to reduce the potential for short term pavement support issues. But the

County should be aware that leaving the existing fill in place could eventually lead to minor subsidences (e.g., birdbaths) and settlement-related cracking.

6.1 Site Grading

6.1.1 Subgrade Preparation

All vegetation, topsoil, root mat, debris, and any other unsatisfactory or deleterious materials should be removed from the limits of new construction. Such material should be considered unsuitable for reuse as structural fill.

Due to the poorly compacted nature of the subgrade soil and the presence of scattered rocks/boulders, we recommend that the site be cut to grade and then undercut to 12 inches below the finished subgrade elevation. For areas that are already greater than 12 inches below final subgrade, undercutting will not be necessary unless field conditions identified during proofroll evaluation dictate otherwise. Once undercut, the expose soil should be moisture conditioned and thoroughly densified with repeated passes of a large roller to improve the soil's density and stability.

After densification, the area should be proofrolled with a tandem-axle dump truck weighing between 15 and 25 tons to identify any isolated areas of weak subgrade. Proofrolling should occur in the presence of Southern Engineering so that recommendations can be provided for areas that rut, pump, or deflect excessively. Proofrolling should not be performed on frozen or excessively wet subgrades.

Backfill should consist of a granular material meeting the criteria in Section 6.1.2.1 of this report. If the budget allows, the County should consider placing a layer of geogrid on the exposed undercut soils prior to backfilling. Geogrid will provide reinforcement and added strength to the subgrade soils, which will further reduce the potential for the previously mentioned pavement issues.

6.1.2 Structural Fill

6.1.2.1 Selection

Whether imported or borrowed from an onsite source, structural fill should satisfy the following:

- No excessive deleterious material.
- Organic content no greater than 5% (by weight).
- No rocks or other solid inclusions greater than 3 inches in diameter.
- Maximum Dry Density (MDD) of 95 pounds per cubic foot (pcf) or greater, as determined by the Standard Proctor Compaction Test (ASTM D698).

- Liquid Limit (LL) of 40 or less and a Plasticity Index (PI) of 6 or less, as determined by Atterberg Limit testing (ASTM D4318), unless otherwise noted/allowed.

The onsite silty sands (SM) are expected to meet these criteria and should be considered suitable for reuse as structural fill provided it's free of excessive organic material, large rocks, or other debris.

6.1.2.2 Moisture Conditioning

The water content of structural fill should be maintained within -3% to +3% of the material's optimum water content as determined by the Standard Proctor Compaction Test (ASTM D698). The silty sands at this site dry relatively quickly, so construction in the summer months may require wetting of soil lifts to facilitate proper compaction.

Please note that soil can be deemed unusable due to water content but shall not be classified as unsuitable based solely on water content. When soil water content falls outside of the requirements set herein, the contractor shall be responsible for taking appropriate measures (drying or wetting) to render the soil usable.

6.1.2.3 Compaction

When using large, ride-on compactors without vibratory action, fill should be placed in loose lifts measuring 8 -inch thick or less. Lift thicknesses should be thinned to 4 inches when using smaller, Rammax-type compactors. Structural fill should be compacted to at least 98% of the soil's maximum dry density as determined by ASTM D698 (Standard Proctor test).

It is recommended that the placement and compaction of structural fill be monitored by Southern Engineering. Field compaction testing should be performed in accordance with ASTM D1556 (Sand Cone Method), ASTM D2937 (Drive Cylinder Method), or ASTM D6938/D8167 (Nuclear Methods).

The following compaction test frequencies are recommended as minimums:

- One test per 4,000 square feet for each lift placed in the parking lot and driveways.
- One test per lift for every 100 linear feet of utility trench.

6.2 Pavement

6.2.1 Design

The recommended minimums for asphalt pavement sections are provided in Table 1. Our recommendations are based on the soil conditions encountered in the borings, an estimated California Bearing Ratio (CBR) value of 6.0, the site preparation recommendations contained in this report, and the assumed traffic mix presented below. If the actual anticipated traffic

loadings vary from what we have assumed, we request the opportunity to revise these pavement sections.

- 1,500 automobiles/day
- Three delivery trucks/day
- Two garbage trucks/week
- 1 fire truck (85,000 lb) per quarter
- No buses

Table 1: Asphalt Pavement Sections

Course	Light-Duty Thickness ^{**} , in.	Heavy-Duty Thickness, in.
Surface (S9.5B)	2	3 [*]
Aggregate Base (ABC)	6	8
[*] Two lifts required. ^{**} Automobiles only (no truck traffic).		

The flexible pavement sections provided are based NCDOT/AASHTO design methodology and a standard 20-year design life. Please note that a pavement design life represents the anticipated useful life of the pavement structure before needing replacement, assuming proper maintenance and upkeep.

6.2.2 Construction

The pavement recommendations herein are predicated by the assumption that the subgrade soils are suitable for pavement support and have been properly moisture conditioned and compacted to a uniform and stable condition. To verify stability, we recommend proofrolling the finished subgrade with a tandem-axle dump truck weighing between 25 and 35 tons immediately before stone placement. The same should occur for the stone base prior to asphalt placement. Proofrolling should occur in the presence of Southern Engineering so that recommendations can be provided for areas that rut, pump, or deflect excessively. Proofrolling should not be performed on frozen or excessively wet subgrades. If subgrades are exposed to precipitation or freezing temperatures prior to paving, the area should be re-proofrolled to verify its condition.

All materials and workmanship used during pavement construction should conform to the North Carolina Department of Transportation Standard Specifications for Roads and Structures, current edition. Aggregate base course stone should be compacted to at least 98 percent of its maximum dry density as determined by AASHTO T-180 (modified Proctor). Asphalt shall be placed with appropriate lift thicknesses and achieve the proper compaction for the mix(es) used, as specified in the latest edition of the NCDOT QMS for Asphalt Pavements.

The pavement sections provided herein do not account for construction traffic (dump trucks, concrete trucks, Lulls, etc.), which is typically very heavy. If construction traffic is allowed to operate on paved surfaces, damage should be expected. Considering this, we recommend that paving operations be scheduled toward the end of construction when heavy construction traffic will be less.

6.2.3 Maintenance

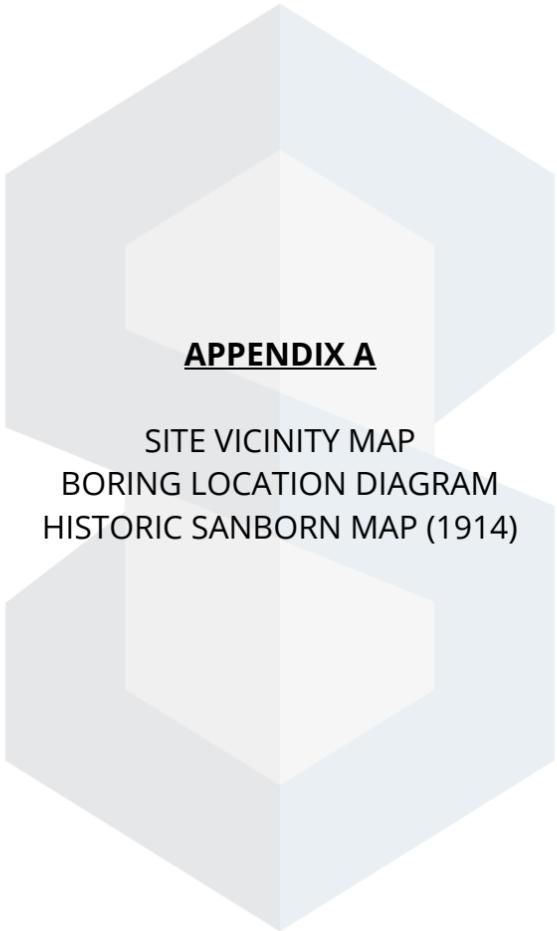
Preventative maintenance should be planned and provided through an ongoing pavement management program to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Preventative maintenance, which consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing), is usually the top priority when implementing a planned pavement maintenance program to provide the highest return on investment for pavements.

7 LIMITATIONS OF THE REPORT

The information and recommendations herein are provided to assist the Architect and Engineers in designing this project. If there are any changes in the intent, design, building location, or construction methodology then the recommendations contained in this report shall not be considered invalid until reviewed by Southern Engineering. If deemed appropriate, we will confirm or modify our recommendations accordingly.

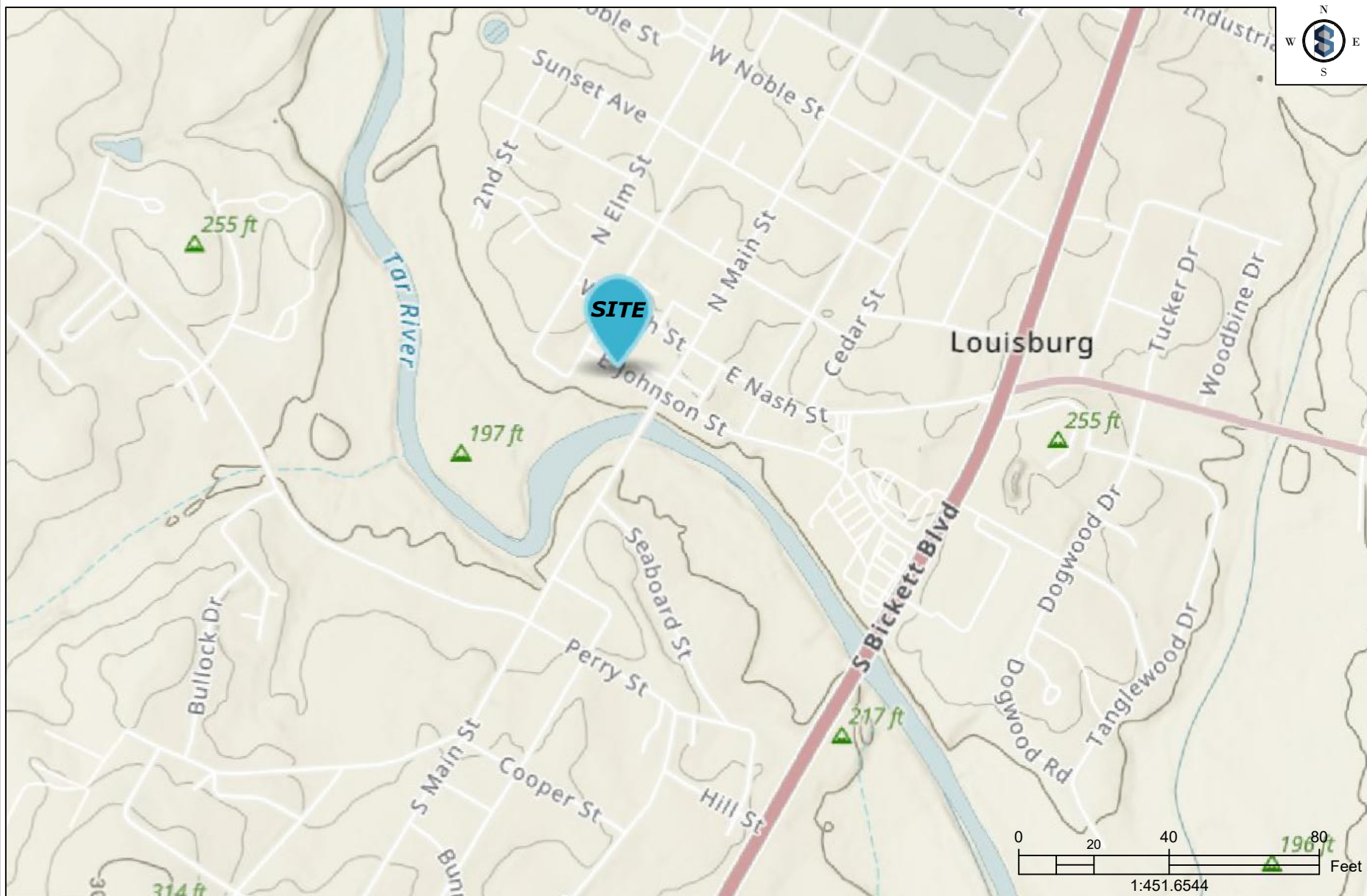
There is a possibility that variations in soil conditions may be encountered during construction. This is not uncommon in this geologic region, even over short distances. During construction, proper evaluation of soil conditions and correlation to the data herein will be critical to building performance, particularly foundations. Since Southern Engineering performed the geotechnical evaluation for this project, we possess firsthand knowledge of the subsurface conditions at this site; therefore, it is recommended that this firm be retained to provide continued testing and observation services during construction. We assume no responsibility for construction compliance with the project's specifications, and/or plans, unless we have been contracted to provide the appropriate services throughout the course of construction.

Please refer to advisory bulletin document in [Appendix D](#), which was prepared by the Geoprofessional Business Association (GBA) to help you better interpret and apply this report to the project. The scope of this study does not include an environmental assessment nor testing and sampling the soil, water, or air for the presence of hazardous materials.



APPENDIX A

SITE VICINITY MAP
BORING LOCATION DIAGRAM
HISTORIC SANBORN MAP (1914)



5400 Old Poole Road, Raleigh, NC 27610
Firm License #: C-4167 (NC); 5297 (SC)
www.southernengineeringnc.com

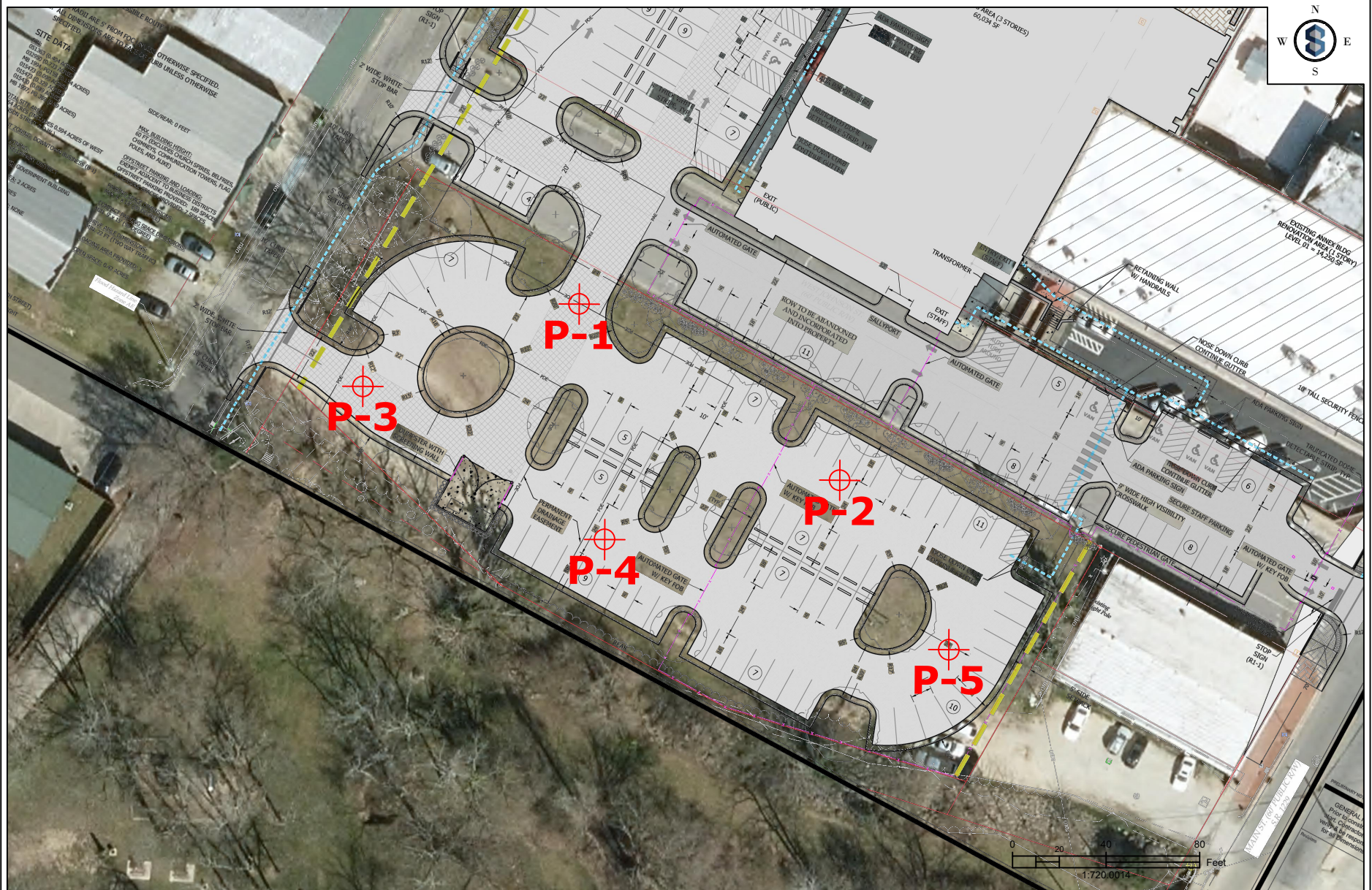
SITE VICINITY MAP
FRANKLIN CO. JUDICIAL CENTER PARKING LOT
W. Johnson St
Louisburg, NC

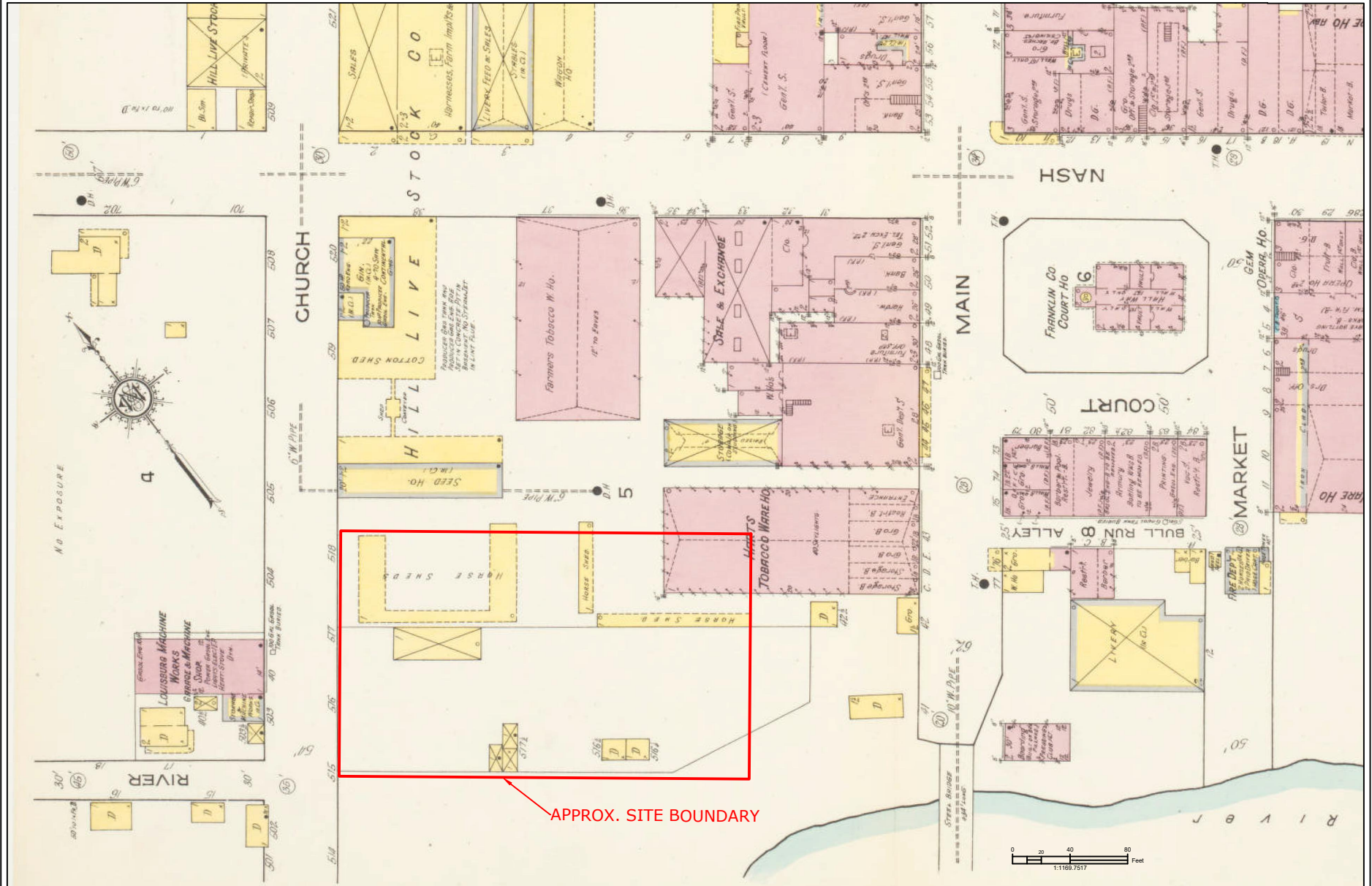
Project No.:	25-1220
Scale:	NTS
Prepared by:	DB
Date:	Aug. 2025

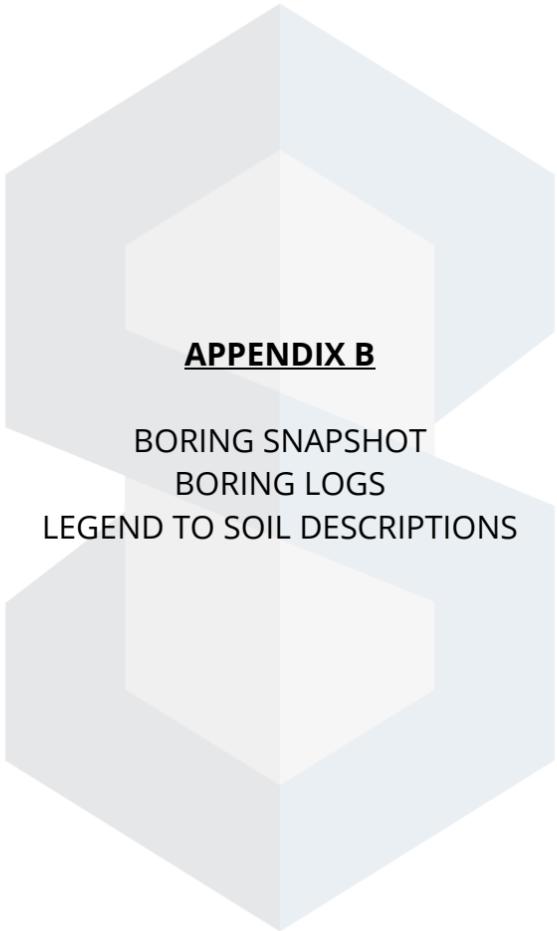
Figure No.:

A1

Note: Drawing adapted from information provided to SE&T. All test locations are approximate (unless otherwise noted) and intended for illustration purposes only.

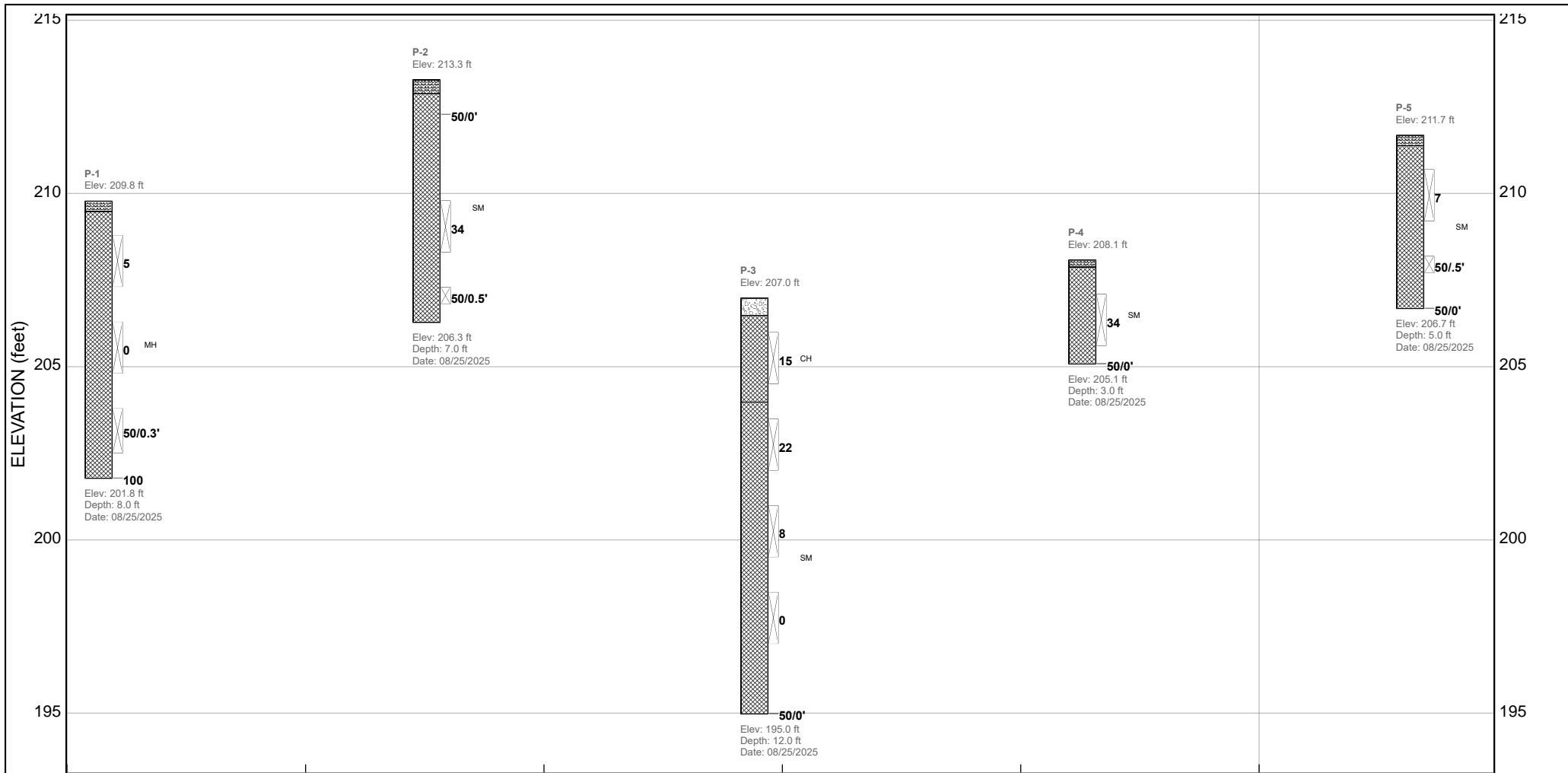






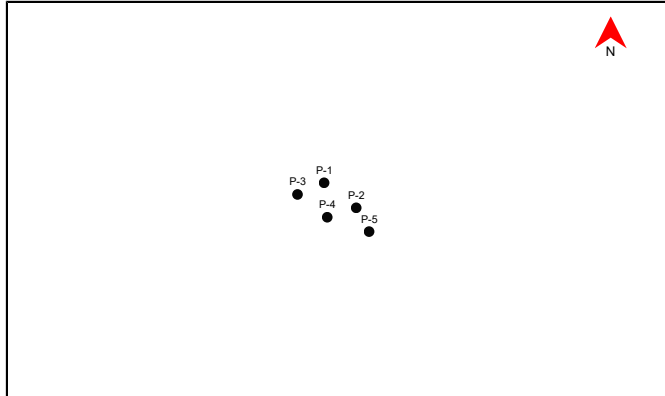
APPENDIX B

BORING SNAPSHOT
BORING LOGS
LEGEND TO SOIL DESCRIPTIONS



SITE MAP

Alignment: -



Franklin Co. Judicial Center Parking Lot
Louisburg, NC

25-1220

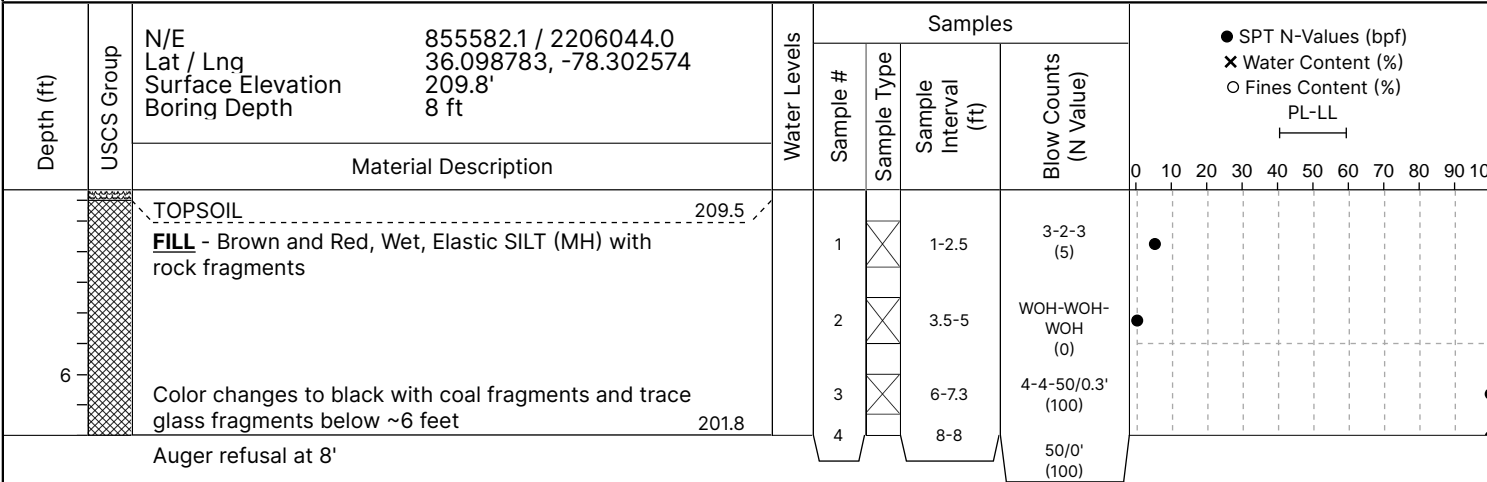
BORING SNAPSHOT





Soil Boring Log: P-1

PROJECT Franklin Co. Judicial Center Parking Lot	CLIENT Oakley Collier Architects
PROJECT LOCATION Louisburg, NC	TIME OF DRILLING WATER None
PROJECT NUMBER 25-1220 DATE DRILLED 08/25/2025	0-HR WATER None 0-HR CAVE IN 2 ft
DRILLING FIRM SE&T	DELAYED WATER N/A DELAYED CAVE IN N/A
METHOD 2.25-inch (ID) Hollow Stem Augers	LENGTH OF DELAY FIAD
EQUIPMENT TMG MC-37 HAMMER TYPE Auto	LOGGED BY D. Brown





Soil Boring Log: P-2

PROJECT Franklin Co. Judicial Center Parking Lot

PROJECT LOCATION Louisburg, NC

PROJECT NUMBER 25-1220 DATE DRILLED 08/25/2025

DRILLING FIRM SE&T

METHOD 2.25-inch (ID) Hollow Stem Augers

EQUIPMENT TMG MC-37 HAMMER TYPE Auto

CLIENT Oakley Collier Architects

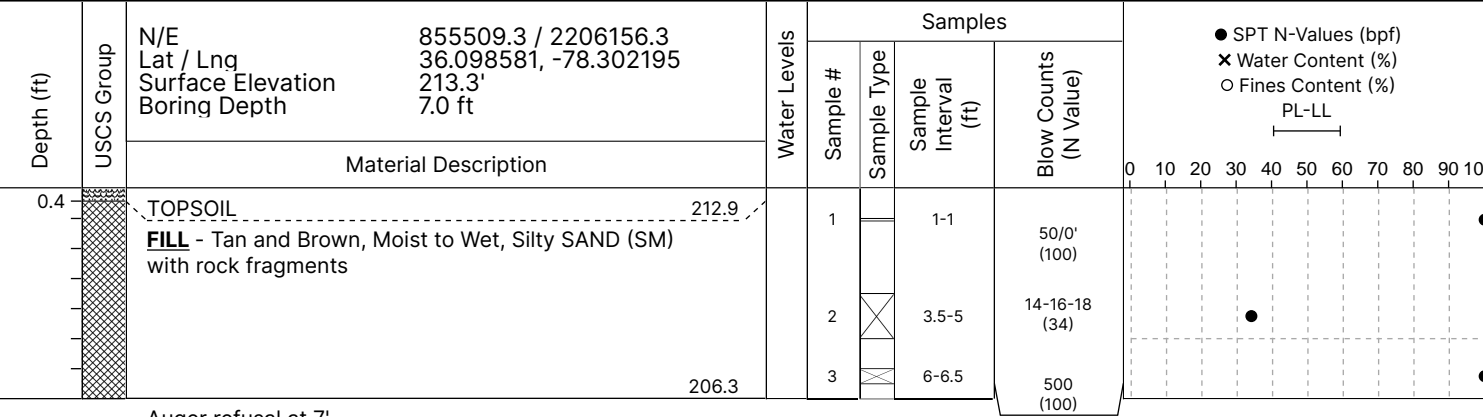
TIME OF DRILLING WATER None

0-HR WATER None 0-HR CAVE IN 3 ft

DELAYED WATER N/A DELAYED CAVE IN N/A

LENGTH OF DELAY FIAD

LOGGED BY D. Brown



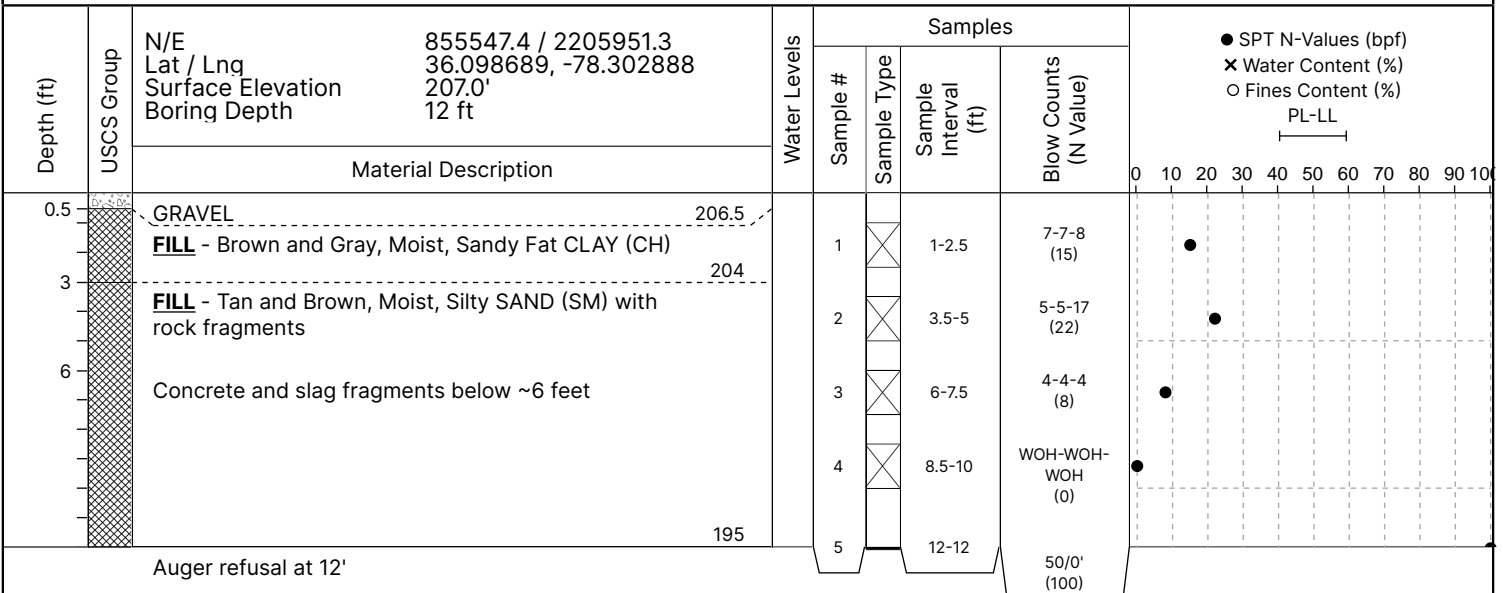
Boring offset 10 feet SE with refusal at 6 feet in fill. Offset from original location 10 feet NW with refusal at 1 foot in fill.



Soil Boring Log: P-3

PROJECT Franklin Co. Judicial Center Parking Lot
PROJECT LOCATION Louisburg, NC
PROJECT NUMBER 25-1220 **DATE DRILLED** 08/25/2025
DRILLING FIRM SE&T
METHOD 2.25-inch (ID) Hollow Stem Augers
EQUIPMENT TMG MC-37 **HAMMER TYPE** Auto

CLIENT Oakley Collier Architects
TIME OF DRILLING WATER None
0-HR WATER None **0-HR CAVE IN** 6 ft
DELAYED WATER N/A **DELAYED CAVE IN** N/A
LENGTH OF DELAY FIAD
LOGGED BY D. Brown

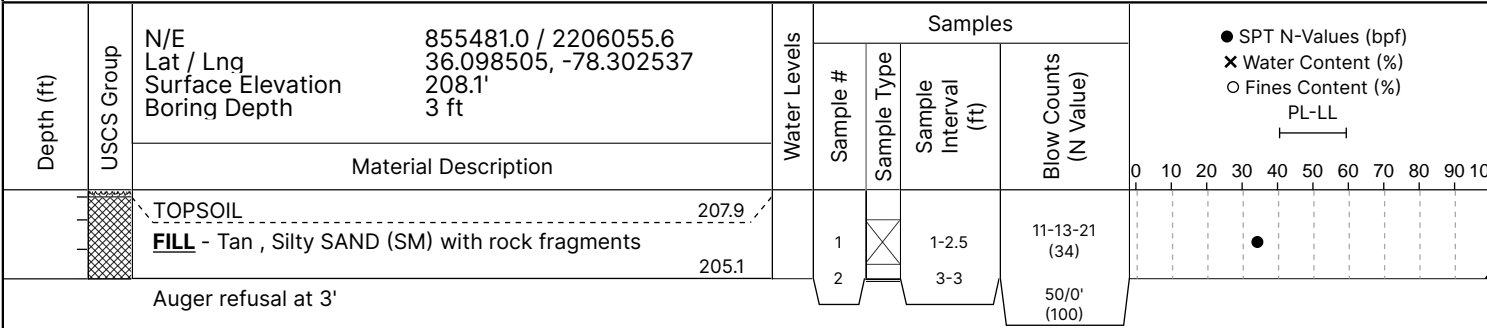


Original boring refused at 5.5 feet in fill. Offset 10 feet with refusal at 12 feet in fill as shown above.
GSE not measured in the field. Estimated and should be considered approximate.



Soil Boring Log: P-4

PROJECT Franklin Co. Judicial Center Parking Lot	CLIENT Oakley Collier Architects
PROJECT LOCATION Louisburg, NC	TIME OF DRILLING WATER None
PROJECT NUMBER 25-1220 DATE DRILLED 08/25/2025	0-HR WATER None 0-HR CAVE IN 3 ft
DRILLING FIRM SE&T	DELAYED WATER N/A DELAYED CAVE IN N/A
METHOD 2.25-inch (ID) Hollow Stem Augers	LENGTH OF DELAY FIAD
EQUIPMENT TMG MC-37 HAMMER TYPE Auto	LOGGED BY D. Brown

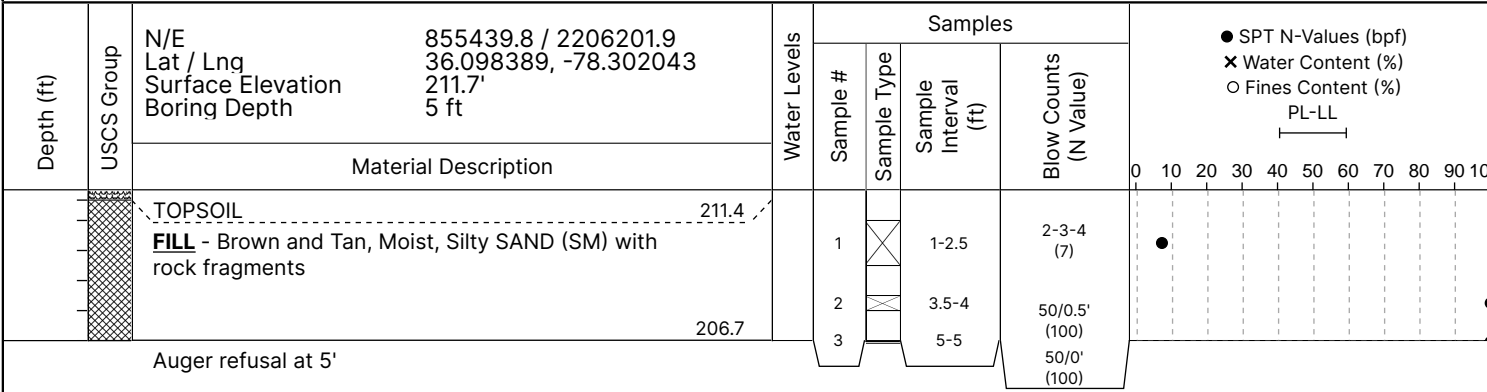


Original boring refused at 3 feet in fill. Offset 10 feet NW with refusal at 1 foot in fill. Offset from original location 10 feet SE with refusal at 1.5 feet in fill.



Soil Boring Log: P-5

PROJECT Franklin Co. Judicial Center Parking Lot	CLIENT Oakley Collier Architects
PROJECT LOCATION Louisburg, NC	TIME OF DRILLING WATER None
PROJECT NUMBER 25-1220 DATE DRILLED 08/25/2025	0-HR WATER None 0-HR CAVE IN 5 ft
DRILLING FIRM SE&T	DELAYED WATER N/A DELAYED CAVE IN N/A
METHOD 2.25-inch (ID) Hollow Stem Augers	LENGTH OF DELAY FIAD
EQUIPMENT TMG MC-37 HAMMER TYPE Auto	LOGGED BY D. Brown



Original boring refused at 5 feet in fill. Offset 10 feet NW with refusal at 1 foot. Offset from original location 10 feet SE with refusal at 1 foot in fill.

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND	
COARSE-GRAINED SOILS > 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL	
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL	
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL	
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL	
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND	
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND	
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND	
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND	
FINE-GRAINED SOILS > 50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LOW PLASTICITY (LEAN) CLAY	
			PI>4 AND PLOTS<"A" LINE	ML	LOW PLASTICITY SILT	
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT	
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	HIGH PLASTICITY (FAT) CLAY	
			PI PLOTS <"A" LINE	MH	HIGH ELASTICITY SILT	
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT	
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT	

ABBREVIATIONS & SYMBOLS

HSA - HOLLOW-STEM AUGER
 HA - HAND AUGER
 SPT - STANDARD PENETRATION TEST
 BPF - BLOWS PER FOOT
 PL - PLASTIC LIMIT
 LL - LIQUID LIMIT
 MC - MOISTURE CONTENT
 SS - SPLIT SPOON
 AP - AUGER PROBE
 WC - WATER CONTENT
 PWR - PARTIALLY WEATHERED ROCK
 USCS - UNIFIED SOIL CLASSIFICATION SYSTEM
 WOH - WEIGHT OF HAMMER
 WOR - WEIGHT OF RODS

AR - AUGER REFUSAL
 REF - REFUSAL
 HAR - HAND AUGER REFUSAL
 FIAD - FILLED IMMEDIATELY AFTER DRILLING/DIGGING
 DRY - REQUIRES WETTING TO REACH OPTIMUM
 MOIST - AT OR NEAR OPTIMUM
 WET - REQUIRES DRYING TO REACH OPTIMUM
 SAT - SATURATED (FREE WATER)
 - WATER LEVEL DURING DRILLING
 - WATER LEVEL IMMED. AFTER DRILLING
 - WATER LEVEL AFTER DELAY (WAIT PERIOD)
 - BOREHOLE CAVE-IN AFTER DRILLING/DELAY

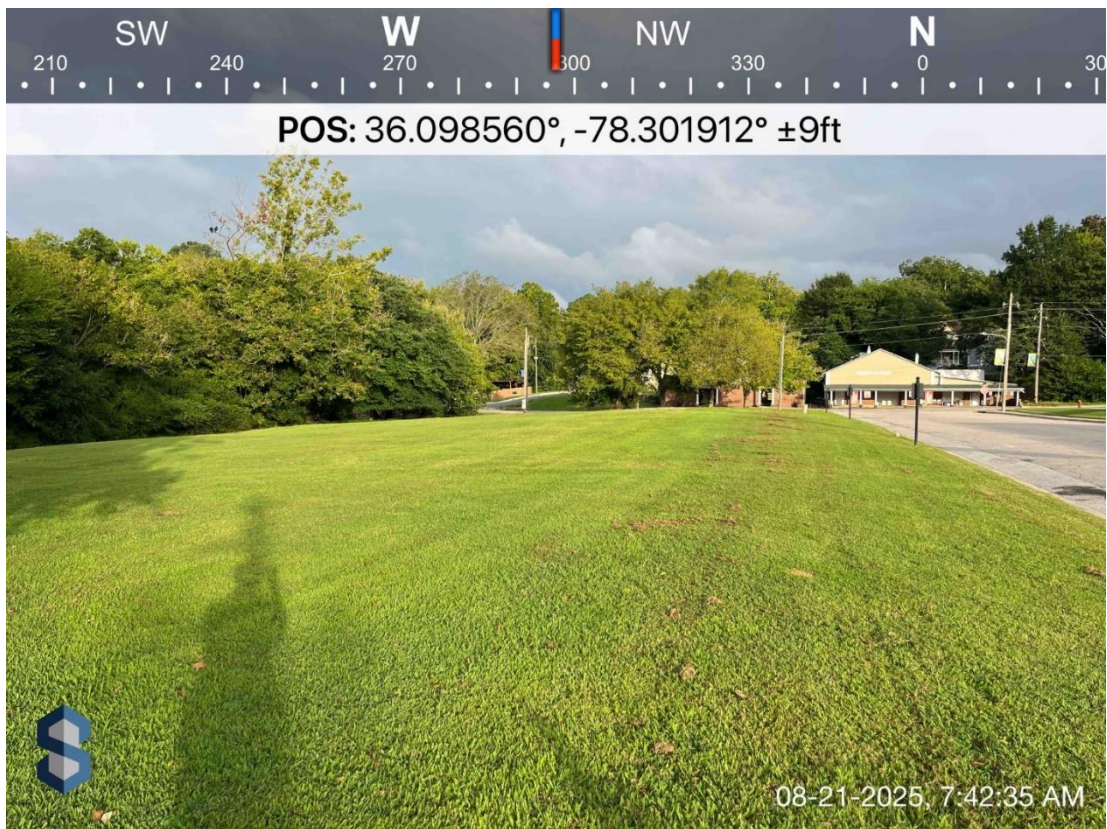
PENETRATION RESISTANCE (RECORDED AS BLOWS PER 6 IN.)			
SAND & GRAVEL		SILT & CLAY	
DENSITY	BLOWS/FT*	CONSISTENCY	BLOWS/FT*
VERY LOOSE	0 - 3	VERY SOFT	0 - 1
LOOSE	4 - 10	SOFT	2 - 4
MEDIUM DENSE	10 - 30	MEDIUM STIFF (FIRM)	4 - 8
DENSE	30 - 50	STIFF	8 - 15
VERY DENSE	51+	VERY STIFF	15 - 30
		HARD	31+

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).



APPENDIX C

SITE PHOTOGRAPHS



Photograph 1: View facing northwest from boring P-2.



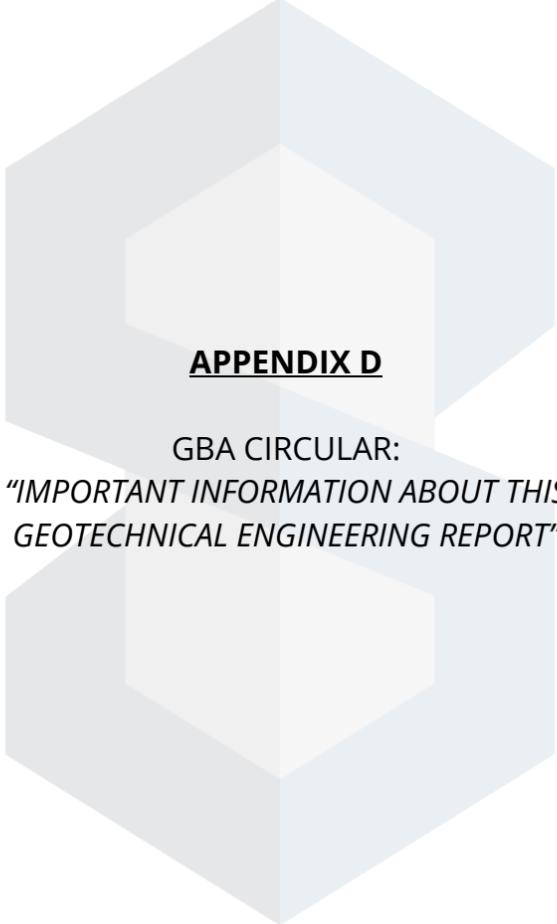
Photograph 2: View facing southeast from boring P-3.



Photograph 3: One of numerous rock outcrops observed at the ground surface.



Photograph 4: Large surficial boulders placed along the south site boundary.



APPENDIX D

GBA CIRCULAR:
*"IMPORTANT INFORMATION ABOUT THIS
GEOTECHNICAL ENGINEERING 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 site-wide 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 not 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 Not 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 not 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 not building-envelope or mold specialists.*



**GEOPROFESSIONAL
BUSINESS
ASSOCIATION**

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

This page intentionally left blank

FORM OF SINGLE PRIME GENERAL CONTRACTOR PROPOSAL

New Judicial Center & Annex Renovations
Franklin County
Architect's Project #21054

Bidder: _____
Date: _____

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

The bidder proposes and agrees if this Proposal is accepted to contract with Franklin County in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation, and labor necessary to complete the new construction & renovations for the New Franklin County Judicial Center & Courthouse Annex Renovations in full accordance with the plans, specifications, and contract documents, to the full and entire satisfaction of Franklin County with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and Contract Documents for the sum of:

SINGLE PRIME CONTRACT: _____

BASE BID _____
_____ Dollars(\$)

Subcontractors:	License No.	Dollars(\$)
Civil:	_____	_____
Plumbing:	_____	_____
Mechanical:	_____	_____
Electrical:	_____	_____

The Bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the Architect and shall fully complete all work within **540** consecutive calendar days from date of commencement established in a Notice to Proceed.

BIDDER further agrees to pay substantial completion liquidated damages, the sum of \$500 for each consecutive calendar, and this amount shall be assessed in accordance with Subparagraph 8.5.1 of the General Conditions.

ALTERNATES

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be “added to” or “deducted from” the base bid. (Strike out “Add” or “Deduct” as appropriate.)

GENERAL CONTRACT:

Alternate No. 1: Two-Ply Roofing:

(Add)(Deduct) _____ Dollars (\$) _____

UNIT PRICES

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

GENERAL CONTRACT:

Unit Price No. 1: Undercut/Fill in Open Excavations	<u>Per 1 Cu.Yd.</u> Unit Price (\$) _____
Unit Price No. 2: Undercut/Fill in Trench Excavations	<u>Per 1 Cu.Yd.</u> Unit Price (\$) _____
Unit Price No. 3: Rock Excavation:	<u>Per 1 Cu.Yd.</u> Unit Price (\$) _____
Unit Price No. 4: Data Outlet & Conduit	<u>Per 1 outlet</u> Unit Price (\$) _____
Unit Price No. 5: Duplex Receptacle & Circuit	<u>Per 1 outlet</u> Unit Price (\$) _____

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bond within ten (10) consecutive calendar days after written notice being given on the award contract, the check, cash or bid bond accompanying this bid shall be paid into the funds of the Owner’s account set aside for the project, as liquidated damages for such failure; otherwise the check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Attach certified check, cash or bid bond to this proposal.

Respectfully submitted this _____ day of _____ 20_____.

Name of firm or corporation making bid

WITNESS:

By: _____

Proprietorship or Partnership

Title: _____
(Owner, Partner, Pres., V. Pres.)

Address: _____

License No: _____

Federal ID No: _____

(Corporate Seal)

ATTEST:

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. Only)

Addenda received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____

Addendum No. 2 _____ Addendum No. 4 _____

For All Official Notices:

Name and Title

Name of Firm/Corporation

Street Address, City, State and Zip

Telephone and Fax Numbers

This page intentionally left blank

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of _____

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

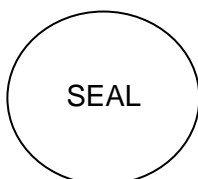
Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ☐ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

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

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

Date: _____ Name of Authorized Officer: _____
 Signature: _____
 Title: _____



State of _____, County of _____
 Subscribed and sworn to before me this _____ day of _____ 20____
 Notary Public _____
 My commission expires _____

**State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract
with Own Workforce.**

County of _____

Affidavit of _____

(Name of Bidder)

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

_____ contract.

(Name of Project)

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

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

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

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

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

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

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.

This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

(Project Name)
Project ID# _____ Amount of Bid \$ _____

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

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

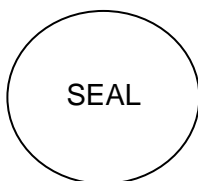
*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

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

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

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

Date: _____ Name of Authorized Officer: _____



Signature: _____

Title: _____

State of _____, County of _____

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

Notary Public _____

My commission expires _____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

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

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

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

Project ID# _____ (Project Name) Amount of Bid \$ _____

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

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

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

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

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

- Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- Copies of quotes or responses received from each firm responding to the solicitation.
- A telephone log of follow-up calls to each firm sent a solicitation.
- For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- Copy of pre-bid roster
- Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- Letter detailing reasons for rejection of minority business due to lack of qualification.
- Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

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

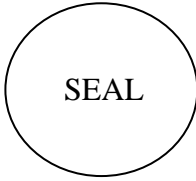
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

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

Notary Public _____

My commission expires _____

Document A310™ – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

BOND AMOUNT: \$

PROJECT:

(Name, location or address, and 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.

ADDITIONS AND DELETIONS:

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

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

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

Signed and sealed this day of ,

(Contractor as Principal)

(Seal)

(Witness)

(Title)

(Surety)

(Seal)

(Witness)

(Title)

Init.

/

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)

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

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

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

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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.

Init.

AIA Document A101™ – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 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 produced by AIA software at 09:00:53 ET on 11/21/2018 under Order No.6883209444 which expires on 04/08/2019, and is not for resale.

User Notes:

(1631732339)

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.
- ☐ 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.)

Init.

[] Not later than () 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

§ 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

§ 4.4 Unit prices, if any:

(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;
- .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.)

§ 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

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)

§ 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
--------	-------	------

- .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.)

Init.

[] 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 A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

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

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 Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

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

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

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

§ 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.

§ 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

Init.

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.

§ 16 Modifications to this bond are as follows:

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

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

SURETY

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

Init.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

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)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

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

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

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

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

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

Init.

§ 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.

§ 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.

§ 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:

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

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

SURETY

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

Certificate of Substantial Completion

PROJECT: *(name and address)*
0000

CONTRACT INFORMATION:
Contract For: General Construction
Date:

CERTIFICATE INFORMATION:
Certificate Number:
Date:

OWNER: *(name and address)*

ARCHITECT: *(name and address)*

CONTRACTOR: *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.

(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE OF SUBSTANTIAL COMPLETION

WARRANTIES

The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED

A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:

(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within () days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: \$0.00

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:

(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE

OWNER *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE

INDEX OF DRAWINGS

GENERAL

G0.01	COVERSHEET
G0.02	BUILDING CODE SUMMARY
G0.31	LIFE SAFETY- LEVEL 01
G0.32	LIFE SAFETY- LEVEL 02
G0.33	LIFE SAFETY- LEVEL 03
G0.40	RATED ASSEMBLIES
G0.41	RATED ASSEMBLIES
G0.50	CONSTRUCTION PHASING

CIVIL

C-0.01	NOTES & LEGENDS
C-1.00	EXISTING CONDITIONS
C-1.01	EXISTING CONDITIONS
C-1.02	DEMOLITION PLAN
C-2.00	SITE PLAN
C-2.01	PLAZA DESIGN PLAN
C-2.02	VEHICLE MOVEMENT ANALYSIS
C-3.00	GRADING & DRAINAGE PLAN
C-3.10	STORM DRAINAGE PROFILES
C-3.11	STORM DRAINAGE PROFILES
C-3.12	STORM DRAINAGE PROFILES
C-3.13	STORM DRAINAGE PROFILES
C-3.14	SWIM MANAGEMENT
C-4.00	UTILITY PLAN
C-5.00	EROSION CONTROL PLAN- PHASE 1A
C-5.01	EROSION CONTROL PLAN- PHASE 1B
C-5.02	EROSION CONTROL PLAN-PHASE 2A
C-5.03	EROSION CONTROL PLAN- PHASE 3
C-6.00	EROSION CONTROL DETAILS
C-6.01	EROSION CONTROL DETAILS
C-6.02	EROSION CONTROL DETAILS
C-6.03	DETAILS
C-6.04	DETAILS
C-6.05	DETAILS
C-6.06	DETAILS
L-1.0	LANDSCAPE PLAN
L-2.0	LANDSCAPE DETAILS

STRUCTURAL

S0.00	COVERSHEET
S0.01	GENERAL NOTES
S0.02	GENERAL NOTES
S0.03	GENERAL NOTES

S0.04	GENERAL NOTES
S0.05	MASTER SUBMITTAL
S0.06	SPECIAL INSPECTIONS
S0.10	STRUCTURAL LOADING
S1.0D1	DEMOLITION PLAN – FOUNDATION
S1.0D2	DEMOLITION PLAN – SLAB ON GRADE
S1.0D3	DEMOLITION PLAN – WALLS
S1.0D4	DEMOLITION PLAN- MEZZANINE
S1.0D5	DEMOLITION PLAN – ANNEX ROOF
S1.10A	FOUNDATION PLAN (NEW BUILDING)- AREA A
S1.10B	FOUNDATION PLAN (NEW BUILDING)- AREA B
S1.11A	SLAB ON GRADE PLAN- AREA A
S1.11B	SLAB ON GRADE PLAN- AREA B
S1.15A	LEVEL 1 WALL / GIRT FRAMING- AREA A
S1.15B	LEVEL 1 WALL FRAMING- AREA B
S1.20A	SECOND FLOOR FRAMING PLAN- AREA A
S1.21A	SECOND FLOOR FRAMING PLAN- AREA A- ENLARGED STAIRS
S1.22A	SECOND FLOOR FRAMING PLAN-AREA A- ENLARGED CONNECTOR
S1.23B	ANNEX ROOF FRAMING- AREA B
S1.25A	LEVEL 2 GIRT FRAMING- AREA B
S1.30A	THIRD FLOOR FRAMING PLAN- AREA A
S1.31A	THIRD FLOOR FRAMING PLAN-AREA A ENLARGED STAIRS
S1.35A	LEVEL 3 GIRT FRAMING PLAN- AREA A
S1.40A	ROOF FRAMING PLAN- AREA A
S1.41A	HIGH ROOF FRAMING PLAN- AREA A
S2.01	JUDICIAL BUILDING FULL SECTIONS
S2.02	JUDICIAL BUILDING FULL SECTIONS
S2.03	JUDICIAL BUILDING FULL SECTIONS
S2.04	JUDICIAL BUILDING FULL SECTIONS
S2.05	JUDICIAL BUILDING FULL SECTIONS
S2.06	JUDICIAL BUILDING FULL SECTIONS
S2.07	JUDICIAL BUILDING FULL SECTIONS
S2.08	JUDICIAL BUILDING FULL SECTIONS
S2.10	JUDICIAL BUILDING PARTIAL SECTIONS
S2.11	JUDICIAL BUILDING PARTIAL SECTIONS
S2.12	JUDICIAL BUILDING PARTIAL SECTIONS
S2.13	JUDICIAL BUILDING PARTIAL SECTIONS
S2.14	JUDICIAL BUILDING PARTIAL SECTIONS
S2.20	ANNEX BUILDING SECTIONS
S2.21	ANNEX BUILDING SECTIONS (SHEAR WALLS)
S2.44	ELEVATOR 1 SECTIONS
S2.45	ELEVATOR 2 WALL SECTIONS
S2.46	STAIR 2 & 3 SECTIONS
S2.50	BRACED FRAME ELEVATIONS
S2.51	BRACED FRAME ELEVATIONS
S2.52	BRACED FRAME ELEVATIONS
S3.01	TYPICAL SLAB ON GRADE DETAILS
S3.02	TYPICAL SLAB ON GRADE DETAILS
S3.03	ELEVATOR PIT DETAILS
S3.04	SHALLOW FOUNDATION DETAILS
S3.05	FOUNDATION WALL DETAILS

S3.06	CONCRETE PEDESTAL DETAILS
S3.07	CONCRETE PEDESTAL DETAILS
S4.20	CMU FRAMING SECTIONS AND DETAILS
S4.21	CMU FRAMING SECTIONS AND DETAILS
S4.22	CMU FRAMING SECTIONS AND DETAILS
S5.01	STEEL COLUMN BASEPLATE DETAILS
S5.03	STEEL COLUMN SPLICE DETAILS
S5.10	TYPICAL STRUCTURAL STEEL CONNECTIONS
S5.11	TYPICAL STRUCTURAL STEEL MOMENT CONNECTIONS
S5.12	TYPICAL STRUCTURAL STEEL BRACED FRAME CONNECTIONS
S5.25	STEEL GIRT DETAILS
S5.30	COMPOSITE STEEL DECK DETAILS
S5.31	COMPOSITE STEEL DETAILS
S5.32	COMPOSITE STEEL DETAILS
S5.33	COMPOSITE STEEL DETAILS
S5.40	STEEL ROOF FRAMING DETAILS
S5.41	STEEL ROOF FRAMING DETAILS
S5.42	STEEL ROOF FRAMING DETAILS
S5.43	STEEL ROOF FRAMING DETAILS
S6.01	TYPICAL LIGHT GAGE METAL STUD DETAILS
S6.02	LIGHT GAGE METAL STUD SHEAR WALL DETAILS

ARCHITECTURAL

D1.01	DEMOLITION PLANS
A0.01	WALL LEGEND
A1.01	SLAB / MASONRY PLAN- LEVEL 1
A1.02	SLAB / MASONRY PLANS- LEVEL 2+3
A1.11	PLAN- LEVEL 1 (OVERALL)
A1.11A	PLAN- LEVEL 1 (AREA A)
A1.11B	PLAN- LEVEL 1 (AREA B)
A1.12	PLAN- LEVEL 2
A1.13	PLAN- LEVEL 3
A1.14	ROOF PLAN
A1.21	REFLECTED CEILING PLAN- LEVEL 1 (OVERALL)
A1.21A	RCP- LEVEL 1 (AREA A)
A1.21B	RCP- LEVEL 1 (AREA B)
A1.22	RCP- LEVEL 2
A1.23	RCP- LEVEL 3
A1.31	FINISH PLANS- LEVEL 01 (AREA A)
A1.31C	FINISH PLANS- LEVEL 01 (AREA B)
A1.32	FINISH PLANS- LEVEL 02
A1.33	FINISH PLANS- LEVEL 03
A2.01	OVERALL BUILDING ELEVATIONS
A2.02	OVERALL BUILDING ELEVATIONS
A2.03	OVERALL BUILDING ELEVATIONS
A3.01	BUILDING SECTIONS
A3.02	BUILDING SECTIONS
A3.11	WALL SECTIONS- EXTERIOR
A3.12	WALL SECTIONS- EXTERIOR
A3.13	WALL SECTIONS- EXTERIOR

A3.14	WALL SECTIONS- EXTERIOR
A3.31	VERTICAL CIRCULATION- STAIR #1
A3.32	VERTICAL CIRCULATION- STAIR #2
A3.33	VERTICAL CIRCULATION- STAIR # 3
A3.34	VERTICAL CIRCULATION- ELEV #3/4
A4.01	ENLARGED PLANS
A4.02	ENLARGED PLANS- CLERK COURTROOM
A4.03	ENLARGED PLANS- DISTRICT COURT 1
A4.04	ENLARGED PLANS- DISTRICT COURT 2
A4.05	ENLARGED PLAN
A4.10	ENLARGED PLANS- RESTROOMS
A4.11	ENLARGED PLANS- RESTROOMS
A4.12	ENLARGED PLANS- RESTROOMS
A5.01	EXTERIOR DETAILS
A5.02	EXTERIOR DETAILS
A5.03	EXTERIOR DETAILS
A5.04	EXTERIOR DETAILS
A5.05	EXTERIOR DETAILS
A5.12	INTERIOR DETAILS
A6.01	DOOR SCHEDULE
A6.02	ASSEMBLED GLAZING

FIRE PROTECTION

FP0.00	FIRE PROTECTION NOTES, LEGEND, AND FIXTURE SCHEDULES
FP1.10	OVERALL LEVEL 1 FIRE PROTECTION PLAN
FP1.11	OVERALL FIRE PROTECTION PLAN- LEVEL 2+3
FP2.01	FIRE PROTECTION SECTION VIEW
FP3.01	FIRE PROTECTION SITE PLAN

PLUMBING

P0.00	PLUMBING NOTES LEGEND AND FIXTURE SCHEDULE
P0.01	PLUMBING FIXTURE SCHEDULE
P1.11	PLUMBING PLAN- LEVEL 1 (OVERALL)
P1.11A	LEVEL 1- ENLARGED WASTE PIPING PLAN (AREA A)
P1.11B	LEVEL 1- ENLARGED WASTE PIPING PLAN (AREA B)
P1.11C	LEVEL 1- ENLARGED WASTE PIPING PLAN (AREA C)
P1.12	OVERALL LEVEL 2+3 WASTE PIPING PLAN
P1.12A	LEVEL 2- ENLARGED WASTE PIPING PLAN (AREA A)
P1.12B	LEVEL 2- ENLARGED WASTE PIPING PLAN (AREA B)
P1.13A	LEVEL 3- ENLARGED WASTE PIPING PLAN (AREA A)
P1.13B	LEVEL 3- ENLARGED WASTE PIPING PLAN (AREA B)
P1.14	PLUMBING PLAN – ROOF
P1.21A	LEVEL 1- ENLARGED WATER PIPING PLAN (AREA A)
P1.21B	LEVEL 1- ENLARGED WATER PIPING PLAN (AREA B)
P1.21C	LEVEL 1- ENLARGED WATER PIPING PLAN (AREA C)
P1.22A	LEVEL 2- ENLARGED WATER PIPING PLAN (AREA A)
P1.22B	LEVEL 2- ENLARGED WATER PIPING PLAN (AREA B)
P1.23A	LEVEL 3- ENLARGED WATER PIPING PLAN (AREA A)
P1.23B	LEVEL 3- ENLARGED WATER PIPING PLAN (AREA B)

P2.01	WATER PIPING RISER
P3.01	PLUMBING DETAILS

MECHANICAL

M0.00	MECHANICAL NOTES LEGEND AND DETAILS
M0.01	MECHANICAL SCHEDULES
M0.02	VENTILATION SUMMARY
M0.03	VENTILATION SUMMARY
M1.10	OVERALL LEVEL 1 MECHANICAL PLAN
M1.10A	LEVEL 1- ENLARGED MECHANICAL PLAN (AREA A)
M1.10B	LEVEL 1- ENLARGED MECHANICAL PLAN (AREA B)
M1.10C	LEVEL 1- ENLARGED MECHANICAL PLAN (AREA C)
M1.11	OVERALL LEVEL 2 MECHANICAL PLAN
M1.11A	OVERALL LEVEL 2 MECHANICAL PLAN (AREA A)
M1.11B	OVERALL LEVEL 2 MECHANICAL PLAN (AREA B)
M1.12A	OVERALL LEVEL 3 MECHANICAL PLAN (AREA A)
M1.12B	OVERALL LEVEL 3 MECHANICAL PLAN (AREA B)
M1.13	MECHANICAL PLAN – ROOF
M2.1	MECHANICAL DETAILS
M2.2	MECHANICAL DETAILS
M2.3	CONTROLS DETAILS

ELECTRICAL

E0.00	ELECTRICAL LEGEND, NOTES, DETAILS
E0.01	ELECTRICAL DETAILS
E0.02	LIGHT FIXTURE SCHEDULE, LIGHTING DETAILS
E1.00	ELECTRICAL SITE PLAN
E1.10	OVERALL LEVEL 1 LIGHTING PLAN
E1.10A	LEVEL 1- ENLARGED LIGHTING PLAN
E1.10B	LEVEL 1- ENLARGED LIGHTING PLAN
E1.10C	LEVEL 1- ENLARGED LIGHTING PLAN
E1.11	OVERALL LEVEL 2 & 3 LIGHTING PLAN
E1.11A	LEVEL 2- ENLARGED LIGHTING PLAN
E1.11B	LEVEL 2- ENLARGED LIGHTING PLAN
E1.12A	LEVEL 3- ENLARGED LIGHTING PLAN
E1.12B	LEVEL 3- ENLARGED LIGHTING PLAN
E1.20A	LEVEL 1- ENLARGED POWER PLAN
E1.20B	LEVEL 1- ENLARGED POWER PLAN
E1.20C	LEVEL 1- ENLARGED POWER PLAN
E1.21A	LEVEL 2- ENLARGED POWER PLAN
E1.21B	LEVEL 2- ENLARGED POWER PLAN
E1.22A	LEVEL 3- ENLARGED POWER PLAN
E1.22B	LEVEL 3- ENLARGED POWER PLAN
E1.23	POWER PLAN- ROOF
E1.30A	LEVEL 1- ENLARGED HVAC POWER PLAN
E1.30B	LEVEL 1- ENLARGED HVAC POWER PLAN
E1.30C	LEVEL 1- ENLARGED HVAC POWER PLAN
E1.31A	LEVEL 2- ENLARGED HVAC POWER PLAN
E1.31B	LEVEL 2- ENLARGED HVAC POWER PLAN

E1.32A	LEVEL 3- ENLARGED HVAC POWER PLAN
E1.32B	LEVEL 3- ENLARGED HVAC POWER PLAN
E1.33	HVAC POWER PLAN- ROOF
E2.00	POWER RISER- PHASE 1
E2.01	DEMOLITION POWER RISER- PHASE 2
E2.02	POWER RISER- PHASE 2
E2.03	COMMUNICATION RISER, SECURITY RISER
E2.04	PANEL SCHEDULES
E2.05	PANEL SCHEDULES
E2.06	PANEL SCHEDULES
E2.07	PANEL SCHEDULES

FIRE ALARM

FA0.00	FIRE ALARM, LEGEND, NOTES, DETAILS
FA1.10	LEVEL 1- OVERALL FIRE ALARM PLAN
FA1.10A	LEVEL 1- ENLARGED FIRE ALARM PLAN- A
FA1.10B	LEVEL 1- ENLARGED FIRE ALARM PLAN- B
FA1.10C	LEVEL 1- ENLARGED FIRE ALARM PLAN- C
FA1.11	LEVEL 2 & 3- OVERALL FIRE ALARM PLAN
FA1.11A	LEVEL 2- ENLARGED FIRE ALARM PLAN- A
FA1.11B	LEVEL 2- ENLARGED FIRE ALARM PLAN-B
FA1.12A	LEVEL 3- ENLARGED FIRE ALARM PLAN- A
FA1.12B	LEVEL 3- ENLARGED FIRE ALARM PLAN- B

**SECTION 01 10 00
SUMMARY****PART 1 GENERAL****1.01 PROJECT**

- A. Project Name: New Judicial Center & Courthouse Annex Renovations for Franklin County.
- B. Owner's Name: Franklin County.
- C. Architect's Name: Oakley Collier Architects, PA.
- D. Additional Project contact information is specified in Section 00 01 03 - Project Directory.
- E. The Project consists of the construction of a three-story, 56,000 square foot building and the renovation of an existing 14,000 square foot Courthouse Annex building. The project includes new construction & renovations, site development, plumbing, mechanical and electrical systems. The building includes secure entry, open lobby, multiple courtrooms, Judges' chambers and 'back of house' Court support spaces, secure sallyport and inmate holding areas, administrative & Court-related office areas, District Attorney's Offices, Clerk of Courts offices, records, support and storage spaces and general building support spaces. New construction & renovations includes structural steel, slab on grade and elevated slab, brick veneer, precast veneer, metal panels, membrane roofing systems, masonry and steel stud interior walls, aluminum storefront & curtainwall, doors, hardware and associated specialties.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on stipulated sum .

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion.
- B. Items noted OSOI (Owner Supplied Owner Installed) will be supplied and installed by the Owner.
- C. Items noted OSCI (Owner Supplied Contractor Installed) will be supplied by the Owner and installed by the Contractor:
- D. Items noted CSCI (Contractor Supplied Contractor Installed) will be supplied and installed by the Contractor.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Arrange use of site to allow:
 - 1. Work by Others.
 - 2. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Existing building spaces may not be used for storage.
- E. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.

2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.06 WORK SEQUENCE

- A. Construct Work in stages during the construction period:
 1. Stage 1: New Construction of 3-story Judicial Center.
 2. Stage 2: Renovations to existing Courthouse Annex.
- B. Coordinate construction schedule and operations with Owner.

1.07 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 00 01 03 - Project Directory.
- C. Section 01 20 00 - Price and Payment Procedures.
- D. Section 01 21 00 - Allowances.
- E. Section 01 22 00 - Unit Prices.
- F. Section 01 23 00 - Alternates.
- G. Section 01 30 00 - Administrative Requirements.
- H. Section 01 32 16 - Construction Progress Schedule.
- I. Section 01 40 00 - Quality Requirements.
- J. Section 01 50 00 - Temporary Facilities and Controls.
- K. Section 01 51 00 - Temporary Utilities.
- L. Section 01 52 13 - Field Offices and Sheds.
- M. Section 01 58 13 - Temporary Project Signage.
- N. Section 01 60 00 - Product Requirements.
- O. Section 01 70 00 - Execution and Closeout Requirements.
- P. Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit electronic copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 30 00.

2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 3. Partial release of liens from major subcontractors and vendors.
 4. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
- E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- G. Substantiation of Costs: Provide full information required for evaluation.
 1. Provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

- K. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

This page intentionally left blank

**SECTION 01 21 00
ALLOWANCES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Cash/Unit Price allowances.
- B. Contingency allowance.
- C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH/UNIT PRICE ALLOWANCES

- A. Costs Included in Cash/Unit Price Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts
- B. Architect Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products .
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
- C. Contractor Responsibilities:
 - 1. Assist Architect in selection of products .
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

1.04 CONTINGENCY ALLOWANCE

- A. All expenditures from Contingency Allowance shall be approved by Architect prior to ordering, purchasing or committing to expenditure.
- B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- C. Funds will be drawn from the Contingency Allowance only by Contingency Disbursement or Change Order. The Architect shall provide a Contingency Disbursement form for use and shall keep account of all funds approved/used.
- D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.05 ALLOWANCES SCHEDULE

- A. **Unit Price Allowance No. 1 - Undercut/Fill in Open Excavations.**
 - 1. The contractor shall stipulate the allowance amount to be included in the Base Bid for 3,500 cubic yards based on the description of work and unit of measurement cost provided for in Section 01 22 00 - Unit Prices, Unit Price No. 1.
- B. **Unit Price Allowance No.2 - Undercut/Fill in Trench Excavations.**
 - 1. The contractor shall stipulate the allowance amount to be included in the Base Bid for 500 cubic yards based on the description of work and unit of measurement cost provided for in Section 01 22 00 - Unit Prices, Unit Price No. 2.
- C. **Unit Price Allowance No. 3 - Rock Excavation**

1. The contractor shall stipulate an amount to be included in the Base Bid to provide 75 cubic yards rock excavation based on the description of work and unit of measurement cost provided in Section 01 22 00 - Unit Prices, Unit Price No. 3.
- D. **Unit Price Allowance No. 4 - Data Outlet and Conduit.**
 1. The contractor shall stipulate the allowance amount to be included in the Base Bid for 50 occurrences based on the description of work and unit of measurement cost provided for in Section 01 22 00 - Unit Prices, Unit Price No. 4.
- E. **Unit Price Allowance No. 5 - Duplex Receptacle and Circuit.**
 1. The contractor shall stipulate the allowance amount to be included in the Base Bid for 50 occurrences based on the description of work and unit of measurement cost provided for in Section 01 22 00 - Unit Prices, Unit Price No. 5.
- F. **Contingency Allowance No. 6 - Owner's Contingency.**
 1. Include in the base bid amount an allowance of \$200,000 for Owner's Contingency. Contingency items shall be as determined and approved by the Architect and include all materials, labor, profit, and overhead associated with the approved contingency item.
- G. **Cash Allowance No. 7 - Brick.**
 1. Include in the base bid amount an allowance of \$700 per 1000 brick for purchase and delivery of Brick Veneer. See Section Unit Masonry
- H. **Cash Allowance No. 8 - Design, Testing and Installation of Bi-Directional Amplifier (BDA) System.**
 1. The contractor include in the Base Bid a cash allowance amount of \$150,000 for the design, testing, purchase, delivery & installation of the BDA system required for the building.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

**SECTION 01 22 00
UNIT PRICES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.
- C. Defect assessment and non-payment for rejected work.

1.02 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Testing agency will take all measurements and compute quantities accordingly.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement Devices:
 - 1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
 - 3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.
- E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- G. Measurement by Area: Measured by square dimension using mean length and width or radius.
- H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
- J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

1.06 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.

2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.07 DEFECT ASSESSMENT

- A. Replace Work, or portions of the Work, not complying with specified requirements.
- B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
 1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect, or:
 2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.
- C. The authority of the Architect to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

- A. Item: Unit Price No. 1 - Undercut/Fill in Open Excavations.
 1. Description: Removal of unsuitable soils encountered in open excavations and replacement with suitable off site fill material as authorized by the Architect, including disposal of excavated unsuitable materials off site, if required, and as further defined in Division 31 - Earthwork.
 2. Unit of Measurement: per (1) Cubic Yard Excavated
- B. Item: Unit Price No. 2 - Undercut/Fill in Trench Excavations.
 1. Description: Removal of unsuitable soils encountered at subgrade elevations and replacement with suitable off site washed stone material in trench excavations (including footings) as authorized by the Architect, including disposal of excavated unsuitable materials off site, if required, and as further required in Division 31- Earthwork.
 2. Unit of Measurement: per (1) Cubic Yard Excavated
- C. Item: Unit Price No. 3 -Rock Excavation:.
 1. Description: Removal and disposal of materials and obstructions encountered subgrade and as further defined in Division 31 - Earthwork.
 2. Unit of Measurement: per (1) Cubic Yard Excavated.
- D. Item: Unit Price No. 4 - Data Outlet and Conduit.
 1. Description: Furnish and install data outlet and conduit to above ceiling in same configuration as delineated in the plans.
 2. Unit of Measurement: Per single outlet.
- E. Item: Unit Price No. 5 - Duplex Receptacle and Circuit.
 1. Description: Furnish and install duplex receptacle and circuit to panel in same configuration as delineated in the plans.
 2. Unit of Measurement: Per single outlet.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

**SECTION 01 23 00
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

- A. Alternate No. G-1 - Roofing:
 - 1. The contractor shall stipulate the sum to be added to the Base Bid for the installation of two-ply cold applied SBS modified bitumen roofing system (80-mil base sheet with 155-mil cap sheet system) in lieu of specified single-ply PVC roofing as delineated in the bid documents. Manufacturer shall be ISO 9001 certified, provide a 30-year NDL warranty and routine inspections/reporting during construction. The Basis of Design for this product is The Garland Company or an approved equal substitution.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

This page intentionally left blank

**SECTION 01 25 00
SUBSTITUTION PROCEDURES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 2. Agrees to provide the same warranty for the substitution as for the specified product.
 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Warranties.
 - 6) Other salient features and requirements.
 - 7) Include, as appropriate or requested, the following types of documentation:

- (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
- D. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

This page intentionally left blank

**SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Progress photographs.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Requests for Interpretation (RFI) procedures.
- K. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRECONSTRUCTION MEETING**

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal schedule.
 - 6. Designation of personnel representing the parties to Contract, Owner and Architect.

7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Scheduling.
 9. Scheduling activities of a Geotechnical Engineer.
- D. Architect will record minutes and distribute copies within two days after meeting to participants, with electronic copies to participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Contractor will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements.
 3. Construction facilities and controls provided by Owner.
 4. Temporary utilities provided by Owner.
 5. Survey and building layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.
 10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
- D. Contractor will record minutes and distribute copies within two days after meeting to participants, with electronic copies to participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.

- D. Contractor will record minutes and distribute copies within two days after meeting to participants, with electronic copies to participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.
 - 6. Final completion, minimum of ten (10) photos.
- E. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.06 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INTERPRETATION (RFI)

- A. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.

- a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Architect.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
- G. Review Time: Architect will respond and return RFIs to Contractor within fourteen calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
- H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to

Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

3.08 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
 - 2. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - 3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 - 4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Send submittals in electronic format via email to Architect.
 - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
 - 8. Provide space for Contractor and Architect review stamps.
 - 9. When revised for resubmission, identify all changes made since previous submission.
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 - 2. Do not reproduce Contract Documents to create shop drawings.
 - 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
 - 1. Transmit related items together as single package.
 - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 - 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 - 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
 - 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

This page intentionally left blank

**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 REFERENCE STANDARDS

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016, with Addendum (2021).

1.03 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- G. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.04 QUALITY ASSURANCE

- A. Contractor's Administrative Personnel: Three years minimum experience in using and monitoring CPM schedules on comparable projects.

1.05 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches (560 x 432 mm).
- C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

- F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- G. Indicate delivery dates for owner-furnished products and products identified under Allowances.
- H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Architect , and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

**SECTION 01 33 00
SUBMITTAL PROCEDURES****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. The Contract Documents, Drawings and individual Specification Sections, Contractor's Submission Schedule; apply to this Section.

1.02 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require the Design Professional's responsive action. Action submittals are those submittals indicated in individual specification sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require the Design Professional'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.
- C. 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.
- D. Required Submittal List Utility application: Interacts with and to be used with the Owner's Contract Manager system. The Design Professional uses the utility to itemize the list of submission items needed to be submitted by the Contractor in order to insure the design intent will be satisfied and inclusive of all Project turnover documents and/or Contract Closeout Requirements.
- E. Contractor's Submission Schedule: The itemized list of project submission requirements printed as a report from Contract Manager. The Contractor enters the date each item needs to be submitted in order to meet the schedule.

1.04 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by the construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
- B. Format for Submittals: Submit required submittals in electronic (PDF) file format.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Design Professional's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by the Design Professional for the Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with the performance of the Work.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Commissioning Authority will review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Design Professional review and approval.
 - 3. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 4. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

5. 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. Submit Operation and Maintenance Manuals concurrent with action submittal.
 - b. The Owner or Design Professional 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 re-submittals, as follows. Time for review shall commence on the Design Professional'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 re-submittals.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The Design Professional will advise the Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow 15 days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by the Design Professional's consultants, the Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by the Design Professional.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Design Professional.
 - d. Name of Construction Manager (if applicable).
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number including revision identifier.
 - 1) Submittal number shall be the submittal item number and Submittal Package number designated in the Contractor's Submission Schedule.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Provide means for insertion to permanently record the Contractor's review and approval markings and action taken by the Design Professional.
 4. Include the following information on an inserted cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name and address of Design Professional.
 - d. Name of Construction Manager (if applicable).
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.

- g. Name of subcontractor.
 - h. Name of supplier.
 - i. Name of manufacturer.
 - j. Number and title of appropriate Specification Section.
 - 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. Other necessary identification.
5. Include the following information as keywords in the electronic file meta data:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by the Design Professional.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Additional Copies: Unless the Design Professional observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The Design Professional will return submittals, without review, received from sources other than the Contractor.
- 1. Transmittal Form: Use the Contractor's office form.
 - 2. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Indication of full or partial submittal.
 - j. Drawing number and detail references, as appropriate.
 - k. Transmittal numbered consecutively.
 - l. Submittal and transmittal distribution record.
 - m. Remarks.
 - n. Signature of transmitter.
 - 3. On an attached separate sheet, prepared on the Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by the Design Professional on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- J. Re-submittals: Make re-submittals in same form and format.
- 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 the Design Professional's action stamp.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals that are marked with approval notation from the Design Professional's action stamp.

PART 2 PRODUCTS**2.01 SUBMITTAL PROCEDURES**

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as electronic (PDF) files, to the Design Professional. The Owner may request paper copies of certain submittals for on-site coordination.
 - a. The Design Professional will return annotated file. Annotate and retain one copy of file as an electronic Project turnover document file.
 - b. The Commissioning Authority through the Design Professional will return annotated file.
 - c. PDF file shall be named as follows:
 - 1) Section number, space, dash, space, Submittal number, space, Section name.
 - (a) 00 00 00 - 001 Section Name.
 - (1) The submittal number is section specific.
 - 2. Operation and Maintenance Manual Submittals: Submit concurrent with the Action Submittal, as related in individual Specification Sections.
 - 3. Closeout Submittals: Comply with requirements specified in Section 01 78 00 - Closeout Submittals.
 - 4. Permits, Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Permits, Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- 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. Submittal Package number and Submittal Item number.
 - b. Manufacturer's catalog cuts.
 - c. Manufacturer's product specifications.
 - d. Standard color charts.
 - e. Statement of compliance with specified referenced standards.
 - f. Testing by recognized testing agency.
 - g. Application of testing agency labels and seals.
 - h. Notation of coordination requirements.
 - i. 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 concurrent with Samples.
 - 6. Submit Product Data in electronic (PDF) file format.
- 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. Submittal Package number and Submittal Item number.
 - b. Identification of products.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.

- f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 - 3. Submit Shop Drawings in electronic (PDF) file format.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Submittal Package number and Submittal Item number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: For turnover purpose, submit three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The Design Professional will return submittal with options selected.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. The Design Professional will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a turnover sample.
 - 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. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
 - 4. Submit subcontract list in PDF electronic file, to the Owner.

- F. 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.
- G. 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 American Welding Society (AWS) forms. Include names of firms and personnel certified.
- H. Installer Certificates: Upon the Owner's request, 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.
- I. Manufacturer Certificates: Upon the Owner's request, submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. 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.
- K. 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.
- L. Field Test Reports: Submit 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.

PART 3 EXECUTION

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

3.02 DESIGN PROFESSIONAL'S ACTION

- A. General: The Design Professional will not review submittals that do not bear the Contractor's approval stamp and will return them without action.
- B. Action Submittals: The Design Professional will review each submittal, make marks to indicate corrections or modifications required, and return it.
- C. Informational Submittals: The Design Professional will review each submittal and will return it if it does not comply with requirements.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from the Design Professional.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
- G. On projects that have commissioning, the Commissioning Authority will receive copies of the submittals through the Design Professional and will provide comments on the submittals via the Design Professional.

END OF SECTION

**SECTION 01 40 00
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2025a.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Contractor's information.

- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Contractor.
- F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Contractor.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Contractor.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform Special Inspections only.
- B. Contractor shall employ and pay for services of an independent testing agency to perform all specified testing except for Special Inspections.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory: Authorized to operate in the State in which the Project is located.
 - 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests and inspections required by Architect/Engineer.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency as original testing.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100

STRUCTURAL TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 STANDARDS

- A. The following Standards are listed in this specification:
 - ASTM A6 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
 - ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - ASTM A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
 - ASTM A490 Standard Specification for Heat-Treated Structural Bolts, 150 ksi Minimum Tensile Strength
 - ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled
 - ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - ASTM C25 Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
 - ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - ASTM C33 Standard Specification for Concrete Aggregates
 - ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
 - ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - ASTM C94 Standard Specification for Ready-Mixed Concrete
 - ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)
 - ASTM C117 Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
 - ASTM C127 Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate
 - ASTM C128 Standard Test Method for Specific Gravity and Absorption of Fine Aggregate

ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C140	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C157	Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C330	Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C332	Standard Specification for Lightweight Aggregates for Insulating Concrete
ASTM C495	Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
ASTM C1314	Standard Test Method for Compressive Strength of Masonry Prisms
ASTM D75	Standard Practice for Sampling Aggregate
ASTM D422	Standard Test Method for Particle Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1143	Standard Test Method for Piles Under Static Axial Compressive Load
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil by the Sand Cone Method
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D2922	Standard Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
ASTM D4253	Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Standard Test Method for Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

- ASTM E329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ASTM E605 Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
- ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- ASTM E736 Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
- ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.03 SCOPE OF WORK

- A. Services Provided for the Contractor: An independent testing laboratory will sample and test materials that are components of the final work product of the Contractor and provide certification that the materials meet the required specifications. The laboratory shall oversee the certification process of construction personnel to ensure their qualifications to perform the specified duties. The presence of a testing laboratory shall in no way relieve the Contractor of his obligation to perform the work in accordance with the Contract Documents. The contractor shall be responsible for paying the testing laboratory for these services.
- B. Services Provided for the Owner: An independent testing laboratory will sample and test materials as they are being installed for compliance with specified requirements and report and interpret the results. The laboratory shall monitor the installation of all constructed work and shall perform tests on the completed construction as required to indicate compliance with the various material specifications governing this work. The owner shall be responsible for paying the testing laboratory for these services.

1.04 SPECIAL INSPECTIONS

- A. The Testing Laboratory providing services for the Owner shall provide Special Inspection services for the items listed below. The scope of such services for each item shall be as defined in The International Building Code – 2015 and the North Carolina State amendments. These inspections are mandatory for conformance to the legal requirements of the building code and shall be in addition to the inspections and tests otherwise defined in this specification.
 - 1. Reinforcing Steel Placement
 - 2. Bolts Installed in Concrete
 - 3. Continuous Inspection of Reinforcement Placing
 - 4. Concrete Work
 - 5. Formwork
 - 6. Precast Concrete Erection
 - 7. Inspection of Structural Steel, Bolting, and Welding Material
 - 8. Welding of Structural Steel
 - 9. Spray-Applied Fire-Resistive Materials
 - 10. Prepared Earth Fill
 - 11. Masonry Work

- B. Qualifications of Special Inspector: The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the Building Official, for inspection of the particular type of construction or operation being inspected. The Special Inspector shall meet all legal qualifications of the building code having jurisdiction.
- C. Duties and Responsibilities of the Special Inspector:
 - 1. The special inspector shall observe the work assigned for conformance to the approved design drawings and specifications.
 - 2. The special inspector shall furnish inspection reports to the Building Official, the Architect/Engineer, and the Owner. All discrepancies shall be brought to the immediate attention of the Architect/Engineer, Contractor, and Owner. A report that the corrected work has been inspected shall be sent to the Building Official, the Architect/Engineer, and the Owner.
 - 3. The special inspector shall submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance to the approved plans and specifications and the applicable workmanship provisions of the building code.

1.05 QUALIFICATIONS OF TESTING LABORATORY

- A. The Testing Laboratory selected for either or both scopes of work noted above shall meet the basic requirements of ASTM E329, and shall submit to the Owner, Architect, and Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASHTO Accreditation Program or the National Voluntary Laboratory Accreditation Program.
- B. The Testing Laboratory shall be approved by the Building Official of the city wherein the project is located to perform Special Inspections as outlined in the applicable building code.
- C. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.

1.06 AUTHORITIES AND DUTIES OF THE LABORATORY

- A. Attending Preconstruction Conferences: The Testing Laboratory providing services for the Contractor and the Testing Laboratory providing services for the Owner shall obtain and review the project plans and specifications with the Architect and Engineer as soon as possible prior to the start of construction. All Laboratories shall attend preconstruction conferences with the Architect, Engineer, Project Manager, General Contractor, and Material Suppliers as required to coordinate materials inspection and testing requirements with the planned construction schedule. The Laboratory providing services for the Owner shall participate in such conferences throughout the course of the project.
- B. Outline Testing Program: The Testing Laboratory providing services for the Owner shall be responsible for outlining a written detailed testing and inspection program conforming to the requirements as specified in the Contract Documents and in consultation with the Owner, Architect, and Engineer. The testing and inspection program shall contain an outline of inspections and tests to be performed with reference to applicable sections of the specifications or drawings and a list of personnel assigned to each portion of the work. Such testing program shall be submitted to the Owner, Architect, and Engineer two weeks in advance of the start of construction so as not to delay the start of construction. It shall be the Testing Laboratory's

responsibility that such program conforms to the requirements of the Specifications and falls within the Owner's budget for testing laboratory services. If the allocated budget is not sufficient to cover the services as outlined in the Specifications, it shall be the responsibility of the Laboratory to notify the Architect, Engineer, and Owner so that the Laboratory services can be modified accordingly prior to the start of construction. Furthermore, the Testing Laboratory shall monitor its expenditures throughout the course of the job and notify immediately the Owner, Architect, and Engineer, of any significant deviation from the planned testing program and budget.

- C. **Cost Proposal:** The Testing Laboratory's proposal to the Owner shall contain the outlined testing and inspection program based on a unit price basis for tests and inspections and on an hourly basis for personnel. A total estimated price shall also be submitted.
- D. **Cooperation with Design Team:** The Laboratory shall cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.
- E. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.
- F. **Inspections Required by Government Agencies:** The Testing Laboratory shall perform all inspections and submit all reports and certifications as required by all government agencies.
- G. **Notification of Deficiencies in the Work:** The Laboratory shall notify the Architect, Engineer, and Contractor within 24 hours of discovery by telephone or e-mail, and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.
- H. **Reports:**
 - 1. **Information on Reports:** The Laboratory shall submit copies of all reports of inspections and tests promptly and directly to the parties named below. All reports shall contain at least the following information:
 - a. Project Name
 - b. Date report issued
 - c. Testing Laboratory name and address
 - d. Name and signature of inspector
 - e. Date of inspection and sampling
 - f. Date of test
 - g. Identification of product and Specification section
 - h. Location in the project
 - i. Identification of inspection or test
 - j. Record of weather conditions and temperature (if applicable)
 - k. Results of test regarding compliance with Contract Documents
 - 2. **Copies:** The Laboratory shall send certified copies of test and inspection reports to the following parties:
 - a. 2 copies to the Owner or his representative
 - b. 2 copies to the General Contractor

- c. 1 copy to the Architect
 - d. 1 copy to the Engineer of responsibility
 - e. 1 copy to the Supplier of the material tested
 - 3. Certification: Upon completion of the job, the Testing Laboratory providing services to the Owner shall furnish to the Owner, Architect, and Engineer of Record, a statement signed by a licensed professional engineer that, to the best of their knowledge, all required tests and inspections were made in accordance with the requirements of the Contract Documents.
 - I. Accounting: The Testing Laboratory shall be responsible for separating and billing costs attributed to the Owner and costs attributed to the Contractor.
 - J. Obtaining Product and Material Certifications: The Testing Laboratory shall be responsible for obtaining all product and material certifications from manufacturers and suppliers as specified in the Specifications.
 - K. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.
- 1.07 CONTRACTOR'S RESPONSIBILITY
- A. Cooperation with Design Team: The Contractor shall cooperate with laboratory personnel, provide access to the work, and to manufacturer's operations.
 - B. Furnishing Samples: The Contractor shall provide to the laboratory representative, samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
 - C. Furnishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate all required inspections and tests.
 - D. Advance Notice: The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
 - E. Payment for Substitution Testing: The Contractor shall arrange with the Testing Laboratory providing services for the Contractor and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.
 - F. Payment for Retesting: The Contractor shall be liable to the Owner for the cost for any additional inspections, sampling, testing, and retesting done by the Testing Laboratory providing services for the Owner as required when initial tests indicate work does not comply with the requirements of the Contract Documents.
 - G. Payment by Contractor: The Contractor shall furnish and pay for the following items:
 - 1. Soil survey of the location of borrow soil materials, samples of existing soil materials, and delivery to the Testing Laboratory providing services for the Contractor.
 - 2. Samples of concrete aggregates and delivery to the Testing Laboratory providing services for the Contractor.

3. Concrete mix designs as prepared by his concrete supplier or by the Testing Laboratory providing services for the Contractor.
 4. Concrete coring, tests of below strength concrete, and load tests, if ordered by the Owner, Architect, or Engineer.
 5. Certification of reinforcing steel and pre-stressing steel mill order.
 6. Certification of structural steel mill order.
 7. Certification of portland cement, lime, fly ash.
 8. Certification of welders and preparation of Welding Procedure Specifications.
 9. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Owner, Architect or Engineer to establish equality with specified items.
 10. Concrete cylinders for the purpose of evaluating strength at time of form stripping or for post-tensioning.
 11. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.
- H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and Testing Laboratory providing services for the Owner when the source of any material is changed after the original tests or inspections have been made.
- I. Tests for Suspected Deficient Work: If in the opinion of the Owner, Architect, or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect, or Engineer deem advisable to determine its proper construction. The Owner shall pay all costs if the tests prove the questioned work to be satisfactory.
- 1.08 PAYMENT OF TESTING LABORATORY
- A. The Owner will pay for the initial Laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will be liable to the Owner for the cost for testing and retesting of materials that do not comply with the requirements of the Contract Documents and shall furnish and pay for the testing and inspection of all other items as specified in these Specifications.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 SCOPE OF WORK

- A. The work to be performed by the Testing Laboratory shall be as specified in this Section of the Specification and as determined in meetings with the Owner, Architect, and Engineer.

3.02 EARTHWORK

- A. Tests of Proposed Fill Material: The Testing Laboratory providing services for the Contractor shall conduct a survey of the Contractor's proposed location of borrow soil materials and shall establish the suitability of any proposed fill material by determining the required engineering

properties. Soil tests shall include soil classification by the Atterberg Limit Tests ASTM D4318, and grain size determination by ASTM D422.

- B. Moisture - Density Relationship for Natural and Fill Materials: The Testing Laboratory providing services for the Contractor shall provide one moisture - density curve for each type of soil, natural, imported fill, or on-site fill, encountered in subgrade and fills under building slabs and paved areas. Curves shall be generated in accordance with (i) ASTM D698.
- C. Quality Control Testing Required During Construction:
 - 1. Inspection of Subgrade and Fill: The Testing Laboratory providing services for the Owner shall inspect and approve the following subgrades and fill layers before further construction work is performed thereon:
 - a. Paved Areas and Building Slab Subgrade: Make at least one field density test of the natural subgrade for every 2500 square feet of paved area or building slab but in no case less than three tests. In each compacted fill layer or lift, make one field density test for every 2500 square feet of building slab or paved area but in no case less than three tests.
 - b. Foundation Wall Backfill: Make at least one field density test for each 200 lineal feet of wall with a minimum of 4 tests for the basement walls around the perimeter of each building and a minimum of one test for every other type of foundation wall on the site. Tests shall be at random locations and elevations for each wall.
 - 2. Field Density Tests: Field Density Tests shall be run according to ASTM D1556, ASTM D2937, or ASTM D2922 as applicable.
 - 3. Acceptance Criteria: The results of field density tests by the Testing Laboratory providing services for the Owner will be considered satisfactory if the average of any three consecutive tests has a value not less than the required density with no single test falling more than 2 percent below the required density.
 - 4. Report Copies: All moisture-density curves and results of field density tests shall be submitted to the parties specified earlier in this section.
 - 5. Additional Testing: If reports by the Testing Laboratory providing services for the Owner indicate field densities lower than specified, additional tests will be run by the Testing Laboratory providing services for the Owner with at least the frequencies scheduled above on recompacted fill and/or natural subgrade. The Testing Laboratory shall notify the Contractor on a timely basis for any required retesting so as not to delay the work. The costs of such tests shall be borne by the Contractor.
- D. Foundation Inspection by the Testing Laboratory:
 - 1. Material Testing: The Testing Laboratory providing services for the Owner shall provide testing and inspection of materials used in foundation elements as described below.
 - 2. Spread (Dug) Footings:
 - a. Concrete Cylinders: Make and test concrete cylinders as specified for Poured-in-Place Concrete.
 - b. Reinforcing Steel: Inspect reinforcing steel size, number of bars, and placement and confirm dowel or anchor bolt placement into footing.
- E. Foundation Inspection by the Geotechnical Engineer: The Geotechnical Engineer of Record shall provide inspection service for the following items before and during foundation installation as appropriate for the foundation type. The Geotechnical Engineer shall submit

written field inspection reports promptly after inspection to all parties listed above and report his findings after each inspection by telephone or e-mail to the Engineer.

1. Spread (Dug) Footing:
 - a. Subgrade: Verify that foundation bearing conditions are consistent with soil report tests and that the footing is being installed in the proper soil strata at the proper elevation. Make recommendations regarding adjustment to subgrade or bearing elevation if subgrade is not adequate to support footing.

3.03 REINFORCING STEEL

- A. Visual Inspection: When the Contractor or reinforcing steel Fabricator notifies the Testing Laboratory providing services for the Contractor that a shipment of reinforcing steel is in the final stages of fabrication and ready for shipment, the Testing Laboratory providing services for the Contractor shall inspect the shipment to determine the following:
 1. The bars should be free from injurious defects and shall have a workman-like finish.
 2. Deformations shall be of the proper sizes, shapes, and spacing as detailed in ASTM A615.
 3. The bars shall not have excessive rust and/or pelting.
 4. The bars shall not have any unusual twists or bends.
- B. Identified Stock: Where job material is taken from bundles as delivered from the mill, is properly identified as to heat number and is accompanied by mill and analysis test reports, such material shall be used without further local tests provided an affidavit is given from the Supplier to the Testing Laboratory providing services for the Contractor that the materials conform with the requirements of the ASTM specification as listed on the structural drawings. In case of controversy, the procedure as stipulated below for unidentified stock shall be followed.
- C. Unidentified Stock: For all unidentified stock, the Testing Laboratory providing services for the Contractor shall secure samples of the reinforcing steel bars at the time of inspection. The samples shall conform to the following:
 1. The sample shall include 2 bars for each ten tons or fraction thereof, of each bar size, heat number, and manufacturer being shipped.
 2. The sample bars shall be a minimum of 24 inches in length and should be identical to the material being shipped.

The Testing Laboratory providing services for the Contractor shall tag each of the steel bundles with the Laboratory identification tag and appropriately mark the samples corresponding to the steel being inspected and shipped. The fabricator will supply shipping lists showing the weight of each bar size in the shipment. The sample reinforcing bars shall be returned to the Testing Laboratory providing services for the Contractor for tensile strength tests and bend tests according to ASTM A615. Bend tests will not be required for #14 and #18 bars.
- D. Compression Butt Splices: The Testing Laboratory providing services for the Owner shall provide 100% visual inspection of all compression butt splices on the job. Inspection shall verify splice conformance with the requirements for end bearing splices as set forth in ACI 318 Building Code Requirements for Reinforced Concrete as well as the manufacturer's instructions.
- E. Reinforcing Steel Field Inspection: The Testing Laboratory providing services for the Owner shall inspect all reinforcement before each concrete pour to verify the information noted below.

All inspection reports shall be prepared and distributed in accordance with the local building code and as specified in this specification.

1. Primary and secondary, longitudinal reinforcement has correct size and number in proper layers.
2. Longitudinal reinforcement has correct length and lap.
3. Ties and stirrups are of correct size, spacing, and number and have the proper termination-hook geometry.
4. Unscheduled face reinforcement in beams are provided and are of correct size, number and spacing and have the proper end terminations.
5. Proper hooks are provided at bar ends as detailed.
6. Reinforcement is properly supported and braced to formwork to prevent movement during concreting operation.
7. Reinforcement has proper cover.
8. Sufficient spacing between reinforcement for concrete placement.
9. Dowel reinforcement is of proper size, at proper spacing, and has proper lap length and embedment length.
10. Welded wire reinforcement is composed of flat sheets, has proper wire gage and spacing, is properly supported, and is properly lapped with a length of one square plus two inches.
11. Proper Construction/Control/Expansion joint spacing and reinforcement.
12. Reinforcement around embedded items is erected according to details.
13. Welded reinforcement has been done according to AWS requirements.

3.04 CONCRETE MATERIALS AND POURED IN PLACE CONCRETE

- A. Tests of Portland Cement: Portland Cement shall be tested by the Testing Laboratory providing services for the Contractor for compliance with the requirements of ASTM C150.
 1. Mill Certificates: Mill certificates certifying that the cement has been tested and meets the requirements of the Specifications will be acceptable as test results, provided the cement proposed for use can be identified with test lots. Mill certificates shall be submitted by the Contractor prior to use of any such material.
 2. Retesting: Retesting of cement will be required if:
 - a. In the opinion of the Owner, Architect, or Engineer, the cement has been damaged in storage or transit or is in any way defective.
 - b. The cement has been in storage at the mixing site for over 30 days.
- B. Tests of Aggregates:
 1. The Testing Laboratory providing services for the Contractor shall verify that concrete aggregates proposed for use conform to one of the following specifications:
 - a. ASTM C33
 - b. ASTM C330
 2. Tests of aggregates by the Testing Laboratory providing services for the Contractor shall be made before the concrete mix is established and thereafter as the character of the aggregate changes and whenever the source of materials is changed. The following tests will be required:

- a. Sampling: The Testing Laboratory providing services for the Contractor shall secure samples of aggregate in accordance with ASTM D75 from the concrete Supplier. The proposed aggregate shall not be used until the Laboratory has approved the pit source and the plant capacity and ability to produce uniform products has been verified.
- b. Sieve analysis: ASTM C136
- c. Organic impurities: ASTM C40
- d. Soundness: ASTM C88
- e. Abrasion of Concrete Aggregate: ASTM C131
- f. Specific gravity: ASTM C127 (coarse aggregate), ASTM C128 (fine aggregate)
- g. Deleterious materials: ASTM C33
- h. Materials Passing No. 200 Sieve: ASTM C117

Suppliers record of such tests run on the proposed material will be adequate provided a written affidavit is furnished as a shop drawing submittal.

C. Concrete Mix Designs:

1. The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Concrete Supplier shall provide testing services as required to assist the Contractor in submitting mix designs in accordance with the Specifications for each class of concrete indicated on the structural drawings. Refer to the Cast-in-Place Concrete Specifications for mix design requirements.
2. The Testing Laboratory providing services for the Owner shall review the submitted mix designs for conformance to the specifications and for suitability for use in the project. The Testing Laboratory shall attend the Mix Design Conference and the Pre-Concrete Conference as noted in the Cast-in-Place Concrete Specification.

D. Concrete Test Cylinders by the Testing Laboratory providing services for the Owner:

1. Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C31 (4"Ø x 8"long) and tested in accordance with ASTM C39.
2. Field Samples: Field samples for strength tests shall be taken in accordance with ASTM C172.
3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according to the following minimum frequency guidelines:
 - a. One set for each class of concrete taken not less than once a day.
 - b. Piers: One set for each 50 cubic yards or fraction thereof.
 - c. Basement Walls: One set for each 150 cubic yards.
 - d. Spread Footings: One set for each 50 cubic yards or fraction thereof.
 - e. Floors: One set for each 150 cubic yards or fraction thereof but not less than one set for each 5000 square foot of floor area.
 - f. Columns: One set for each 50 cubic yards or fraction thereof with a minimum of 2 sets per floor. Additional (2) cylinders for columns with strength greater than

7000 psi. A total of six (6) cylinders shall be taken for these critical structural elements.

- g. Shear Walls: One set for each 50 cubic yards but not less than 2 sets per floor.
- h. All Other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof.
- i. No more than one set of cylinders at a time shall be made from any single truck.
- j. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
- k. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.

The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded.

For concrete specified on the drawings to reach the required strength at 28 days, break one of the four cylinders of the set at seven days, two at 28 days, and one at 56 days.

- 4. Additional Cylinder for Floor Form Stripping: One additional cylinder per set will be required for formed slab and pan joist floors for the purpose of evaluating the concrete strength at the time of form stripping. This cylinder shall be stored on the floor where form removal is to occur under the same exposure conditions as the floor concrete. The cylinder shall be cured under field conditions in accordance with ASTM C31. Field cured test cylinders shall be molded at the same time and from the same samples as Laboratory cured test specimens. The cylinder shall be broken at the time of form removal as directed by the Contractor.
- 5. Additional Cylinder for Post-Tensioned Concrete: One additional cylinder per set will be required for post-tensioned concrete floors or walls for the purpose of evaluating concrete strength at the time of stressing. This cylinder shall be subject to the same requirements for curing as stated for the stripping cylinder above. The cylinder shall be tested at the time of stressing as directed by the Contractor.
- 6. Cylinder Storage Box: The Contractor shall be responsible for providing a protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory. The box shall be equipped to maintain the internal temperature of the box to between 60°F and 80°F while storing the cylinders.
- 7. Transporting Cylinders: The Testing Laboratory providing services for the Owner shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders including loss of moisture, freezing temperatures or jarring.
- 8. Information on Concrete Test Reports: The Testing Laboratory providing services for the Owner shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:
 - a. Truck number and ticket number
 - b. Concrete Batch Plant
 - c. Mix design number

- d. Accurate location of pour in the structure
 - e. Strength requirement
 - f. Date cylinders made and broken
 - g. Technician making cylinders
 - h. Concrete temperature at placing
 - i. Air temperature at point of placement in the structure
 - j. Amount of water added to the truck at the batch plant and at the site and whether it exceeds the amount allowed by the mix design
 - k. Slump
 - l. Unit weight
 - m. Air content
 - n. Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven day breaks are to be flagged if they are less than 60% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.
- E. Other Required Tests of Concrete by the Testing Laboratory providing services for the Owner (unless noted otherwise):
- 1. Slump Tests: Slump Tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders made. The slump test shall be made from concrete taken from the end of the concrete truck chute. The concrete shall be considered acceptable if the slump is within plus or minus 1 inch of the slump noted on the mix design submittal form for that class of concrete.
 - 2. Air Entrainment: Air entrainment tests (ASTM C231 or C173, C173 only for lightweight concrete) shall be made at the same time slump tests are made as cited above.
 - 3. Concrete Temperature: Concrete temperature at placement shall be measured (ASTM C1064) at the same time slump tests are made as cited above.
 - 4. Shrinkage Tests: Three 4" x 4" x 11 1/4" samples shall be made and tested according to ASTM C157 for each proposed mix design for each class of concrete.
 - 5. Chloride Ions: The Contractor shall have the Testing Laboratory providing services for the Contractor verify in a written submittal with the mix designs that the chloride ion concentration will not exceed the limits specified.
- Tests shall be run for each class of concrete according to AASHTO Designation T 260-82 Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials to determine that the maximum chloride ion content does not exceed the limits stated in the concrete section of the specifications. One test shall be run for each mix design for each class of concrete at the start of the project and each time a change is made to the mix design (such as a change in aggregate type or source).
- F. Evaluation and Acceptance of Concrete:
- 1. Strength Test: A strength test shall be defined as the average strength of two cylinder breaks from each set of cylinders tested at the time indicated above.
 - 2. Quality Control Charts and Logs: The Testing Laboratory providing services for the Owner shall keep the following quality control logs and charts for each class of concrete

containing more than 2,000 cubic yards. The records shall be kept for each batch plant and submitted on a weekly basis with cylinder test reports:

- a. Number of strength tests made to date
 - b. Strength test results containing the average of all strength tests to date, the high test result, the low test result, the standard deviation, and the coefficient of variation.
 - c. Number of tests under specified strength.
 - d. A histogram plotting the number of strength test cylinders versus compressive strength.
 - e. Quality control chart plotting compressive strength test results for each test.
 - f. Quality control chart plotting moving average for strength where each point plotted is the average strength of three previous test results.
 - g. Quality control chart plotting moving average for range where each point plotted is the average of 10 previous ranges.
3. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
- a. The average of all sets of three consecutive strength tests equal or exceed the required f'_c .
 - b. No individual strength test falls below the required f'_c by more than 500 PSI.

If either of the above requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be taken to increase the average of subsequent strength tests.

G. Investigation of Low Strength Concrete Test Results:

1. Cost of Investigations for Low Strength Concrete: The costs of all investigations of low strength concrete, as defined by any individual strength test falling more the 500 psi below the required f'_c , shall be borne by the Contractor.
2. Scope of Investigations: See Specification Section 3300, Cast-In-Place Concrete, for the investigations that may be required by the Engineer. The Testing Laboratory providing services for the Owner will conduct these investigations.

H. Scope of Batch Plant Inspection: The scope of batch plant inspection by the Testing Laboratory providing services for the Owner shall include the following:

1. Inspection of Batch Plant Facilities: Prior to the start of concrete work, the Testing Laboratory providing services for the Owner shall inspect batch plant facilities proposed for use in the work and report in writing inspection results to the Architect, Engineer, and Owner for approval before the start of the work. The inspection shall follow that outline in ASTM C94 and as recommended by the National Concrete Ready Mix Association. Inspection shall include:
 - a. Batch Plant operations and equipment
 - b. Truck mixers
 - c. Scales
 - d. Stockpile placement
 - e. Material storage
 - f. Admixture dispensers

2. Duties of Inspector: The duties of the batch plant inspector shall include the following:
 - a. Perform initial inspection of batch plant facilities as specified above.
 - b. Secure samples of aggregates for testing.
 - c. Perform visual inspection of aggregates stockpiles to determine uniformity, cleanliness, and moisture variation to be performed each visit to the plant facility.
 - d. Adjust design weights for moisture in aggregates to be performed each visit if required.
 - e. Inspect aggregate conveying system for possible segregation to be performed at each visit.
 - f. Observe batching procedure at each visit. Verify that concrete mix design number is being batched and randomly monitor weighing operation for correct weights of each mix ingredient, including admixture dosages.
 - g. Prior to loading the truck at the batch plant verify that the drum is free of water, fresh concrete, or aggregates. Check conditions and cleanliness of drum, fins, and blades.
 - h. During loading, observe loading procedures.
 - i. After loading, hold the truck for proper mix time and inspect concrete for thorough mix and consistency prior to leaving the batch plant.
 - j. Check size of batch for rated truck capacity.
- I. Job Site Inspection: The scope of the work to be performed by the inspector on the jobsite shall be as follows:
 1. Prior to Concrete Placing
 - a. Spread Footings
 - 1) Verify footing dimension.
 - 2) Verify top of footing elevation.
 - 3) Verify that forms are plumb and straight, braced against movement, and lubricated for removal.
 - 4) Inspect reinforcement per REINFORCING STEEL section.
 - b. Grade Beams
 - 1) Verify width, depth and elevation of grade beams.
 - 2) Verify that forms are plumb and straight, braced against movement, and lubricated for removal.
 - 3) Verify that carton forms below grade beam are dry.
 - 4) Verify that carton forms are neatly formed around piers.
 - 5) Inspect reinforcement per REINFORCING STEEL section.
 - c. Slab-on-Grade
 - 1) Verify that moisture retarder is provided, is lapped properly, and is not torn or punctured.

- 2) Verify formwork at turndowns and slab edges is plumb and straight, braced against movement and lubricated for removal.
 - 3) Inspect reinforcement per REINFORCING STEEL section.
 - 4) Verify there is no standing water or debris in pour area.
- d. Columns
- 1) Verify that forms are plumb and straight, braced against movement, lubricated for removal, and conform to approved shop drawings.
 - 2) Verify proper dimensions and orientation.
 - 3) Verify that top of column elevation is set in form and that it is 1/2 inch below the future slab soffit.
 - 4) Inspect reinforcement per REINFORCING STEEL section.
 - 5) Verify that debris is removed.
- e. Elevated Deck (General)
- 1) Verify that formwork conforms to signed and sealed shop drawings.
 - 2) Verify that shoring layout conforms to signed and sealed shop drawings.
 - 3) Verify that reshores at all levels conforms to signed and sealed shop drawings.
 - 4) Verify that forms are plumb and straight, braced against movement, and lubricated for removal.
 - 5) Verify that the forms used for exposed finish surfaces are of the type specified and provide a joint system as shown on the Architect's drawings.
 - 6) Verify the proper dimensions of girders, beams and joists.
 - 7) Verify that the slab thickness and top-of-slab elevation is correct.
 - 8) Verify that openings and sleeves are correct size and location.
 - 9) Verify that horizontal and vertical sleeves through girders, beams, or joists have been approved by the Engineer and that approved reinforcement is provided.
 - 10) Verify the top of columns are 1/2 inch below the deck soffit.
 - 11) Inspect reinforcement per REINFORCING STEEL section.
 - 12) Verify that debris is removed.
- f. Flat Slabs
- 1) Verify that the top of columns are 1/2 inch below the deck soffit.
 - 2) Verify that openings in the slab are shown on the structural drawings. Notify the engineer immediately of any openings in the field that are not shown on the drawings.

- 3) Inspect the shearhead reinforcing at each column to ensure that it conforms to the structural details.

2. On-Site Concrete Material Testing and Inspection

- a. Verify that the Contractor is following appropriate concreting practices consistent with any extreme environmental conditions at the point of placement in the structure as defined below.
- b. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
- c. Inspect plastic concrete upon arrival at the jobsite to verify proper batching. Observe mix consistency and adding of water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.
- d. Obtain concrete test cylinders.
- e. Perform tests to determine slump, concrete temperature, and air entrainment. The slump tests shall be made on concrete taken from the same location from which the concrete for the test cylinders is obtained.
- f. Record information for concrete test reports.
- g. Verify that all concrete being placed meets job Specifications. Report concrete not meeting the specified requirements and immediately notify the Contractor, Batch Plant Inspector, Architect, Engineer, and Owner.
- h. Pick up and transport to Laboratory, cylinders cast the previous day.

3. During Concrete Placing

- a. Verify that the concrete is not over 90 minutes old at the time of placement.
 - b. Verify that Hot-Weather or Cold-Weather techniques are being applied as required.
 - c. Verify that concrete deposited is uniform and that vertical drop does not exceed six feet and is not permitted to drop freely over reinforcement causing segregation.
 - d. Verify that there are no cold joints.
 - e. Verify that the concrete is properly vibrated.
 - f. Verify that the finishing of the concrete surface is done according to specifications.
 - g. Verify that the curing process is according to specifications and that any curing compound used is applied in accordance with manufacturer's recommendations.
 - h. Verify that sawcut control joints on slab-on-grades are cut within 12 hours of placement.
 - i. Verify that the formwork has remained stable during the concreting operation.
4. The job site inspector shall report any irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.
- J. Causes for Rejection of Concrete: The Contractor shall reject all concrete delivered to the site for any of the following reasons:
1. Wrong class of concrete (incorrect mix design number).
 2. Environmental Conditions: Environmental condition limits shall be as follows unless appropriate provisions in concreting practices have been made for cold or hot weather:
 - a. Cold Weather: Air temperature must be 40°F and rising or the average daily temperature cannot have been lower than 40°F for 3 consecutive days unless the temperature rose above 50°F for at least one-half of any of those 24 hour periods.
 - b. Hot Weather: Environmental conditions must be such that cause an evaporation rate from the concrete surface of 0.2 lb./sq. ft./hr. or less as determined by Figure 2.1.5 in ACI 305R-99.
- Concrete may be placed at other environmental condition ranges only with approval of the job inspector for the Testing Laboratory providing services for the Owner or other duly appointed representative.
3. Concrete with temperatures exceeding 95°F shall not be placed in the structure.
 4. Air contents outside the limits specified in the mix designs.
 5. Slumps outside the limits specified.
 6. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory job inspector or other duly appointed representative.
- The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.
- K. Testing of Concrete Floor Slabs for Acceptability to Receive an Adhesive-Applied, Low-Permeable Floor Covering

1. The following tests shall be made prior to installing adhesive-applied, low-permeability floor coverings such as vinyl composition tile (VCT), linoleum, sheet vinyl, vinyl-backed carpet, rubber, athletic flooring, synthetic turf, wood, acrylic terrazzo, thin-set tile, epoxy overlays and adhesives, et.al.
2. Moisture Vapor Emission Rate: Perform testing according to ASTM F 1869 to determine if the moisture emission rate from the floor is below the flooring manufacturer's maximum recommended value but not greater than 5lbs/1000sq.ft./24h.
3. Alkalinity Testing: Perform testing in accordance with ASTM F 710-98, paragraph 5.3, to determine if the pH level of the concrete slab surface is below the flooring manufacturer's maximum recommended value but not greater than 10. Perform three tests per 1000 sq. ft.

- L. Concrete Batch Trip Tickets: All concrete batch trip tickets shall be collected and retained by the Contractor. Compressive strength, slump, air, and temperature tests shall be identified by reference to a particular trip ticket. All tickets shall contain the information specified in ASTM C94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Contractor and Testing Laboratory providing services for the Owner shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

3.05 STRUCTURAL STEEL

A. Contract Obligations:

1. Owner Responsibility: The Owner shall pay for all initial shop and field inspections and tests as required during the fabrication and erection of the structural steel.
2. Contractor Responsibility: The Contractor shall pay for and arrange with the Testing Laboratory providing services for the Contractor for the certification of all shop and field welders. The Testing Laboratory providing services for the Contractor shall provide the qualification testing required by AWS D1.1 Chapter 4, Part B to qualify any non-prequalified Welding Procedure Specification (WPS) needed for the project. The Testing Laboratory shall prepare Procedure Qualification Records (PQR) documenting the successful qualification of each WPS. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person or crew performing the work. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Laboratory inspector with access to all places where work is being done. A minimum of 24 hours notification shall be given prior to commencement of work. The Contractor shall provide the Testing Laboratory providing services for the Owner with the following:
 - a. A complete set of Architect/Engineer reviewed shop and erection drawings including all revisions and addenda.
 - b. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
 - c. Information as to time and place of all rollings and shipment of material to shops.
 - d. Representative sample pieces requested for testing.
 - e. Full and ample means and assistance for testing all material.

- f. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.
 3. Testing Laboratory Responsibility: The inspection by the Testing Laboratory providing services for the Owner of the Fabricator's work done in the shop shall be performed in the Fabricator's shop to the fullest extent possible. Such inspections shall be in sequence, timely, and performed in such a manner as to minimize disruptions in operations and to permit the repair of all nonconforming work while the material is in process in the fabricating shop. Inspection of field work shall be completed promptly so that corrections can be made without delaying the progress of the work. Inspections shall be performed by qualified technicians with a minimum of two years experience in structural steel testing and inspection. All inspection personnel shall be certified in accordance with AWS QC-1. The Testing Laboratory shall provide test reports of all shop and field inspections. Shop test reports shall include shop welders certifications. All test reports shall indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. In addition to the parties listed in this Specification the Fabricator and Erector shall receive copies of all test reports.
 4. Rejection of Material or Workmanship: The Owner, Architect, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.
- B. Mill Tests of Structural Steel:
 1. Mill Order Steel: The Fabricator shall furnish certified mill test reports and an affidavit stating that the structural steel furnished meets the requirements of the grade specified on the structural drawings for all mill order steel. In case of controversy, tests of the material according to ASTM A6 or A568 as applicable made by the Testing Laboratory providing services for the Contractor with certified test reports paid for by the Contractor shall be made to verify conformity with ASTM standards. Tests shall be made for each 10 tons of material used unless approved otherwise by the Engineer.
 2. Requirements for Heavy Tension Members Used In Welded Connections: The Fabricator shall furnish certified reports and an affidavit stating that structural shapes in ASTM A6, Groups 4 and 5 and Plates exceeding 2 inches thick subject to primary tensile stresses and that are spliced using complete-joint penetration welds or that are used in connections that utilize complete-joint or partial-joint penetrations welds conform to the requirements of the specifications.
 3. Local Stock Steel: Materials taken from stock by a Fabricator for use for structural purposes must be of a quality at least equal to that required by the ASTM specifications applicable to the classification covering the intended use. Certified mill test reports shall be accepted as sufficient record of the quality of materials carried in stock by the fabricator provided the stock steel can be identified by heat or melt numbers. In case of controversy, tests by the Testing Laboratory providing services for the Contractor with certified reports as specified for mill order steel shall be required.
 4. If tests are required, test specimens shall be taken by the Contractor under the direction of the Testing Laboratory providing services for the Contractor and shall be machined by the Testing Laboratory to dimensions as required by the applicable ASTM standards.

- C. Shop Inspections and Tests: The Testing Laboratory providing services for the Owner shall provide inspection at the designated fabrication shops for the designated periods of time to perform shop inspection and tests. The designated fabrication shops and time periods of inspection shall be determined in consultation with the Architect, Owner, and Engineer prior to the start of fabrication in a timely manner so as to not delay the fabrication process. The following tests and inspections shall be performed:
1. Review shop drawings and shop procedures with Fabricator's supervisory personnel.
 2. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
 3. Approve Welding Procedure Specifications submitted by the Contractor. Approve any changes submitted by the Contractor to any WPS that has already been approved. Obtain the Welding Procedure Qualification Record (WPQR) for each successful WPS qualification.
 4. Verify welder qualifications either by certification and/or by retesting. Obtain welder certificates.
 5. Check layout and dimensions of jigs and fixtures for multiple fabrication, joint preparation, and fit up of members.
 6. Verify welding electrodes to be used and other welding consumables as the job progresses.
 7. Check preheating procedures for uniformity and thoroughness through the full thickness of the material. Inspect preheating and interpass temperatures for conformance to AWS D1.1, Table 4.2. Verify procedure for control of distortion and shrinkage stresses.
 8. Verify procedures for welding in accordance with applicable portions of Section 4, "Technique", AWS D1.1.
 9. Inspect welding equipment for capacity, maintenance, and working condition.
 10. Perform random dimensional checks of completed members.
 11. Check camber of beams immediately after cambering.
 12. Provide inspection of surface preparation for coating and coating operations.
 13. Check shipping preparation schedules and obtain copies of shipping lists.
 14. Inspect bolting operations according to inspection procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts".
 15. Perform Arbitration Testing and Inspection according to procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph above.
 16. Make visual inspection of welding in progress for size, length, and quality.
 17. Perform non-destructive examination services for various weldments of shop fabrication determined in consultation with the Structural Engineer prior to the start of fabrication. The testing agency shall submit recommendations to the Structural Engineer for approval as to the type of nondestructive inspection methods best suited to the member being tested. Specifically, the Laboratory shall provide a qualified technician with the necessary equipment to perform the following:

- a. Nondestructive examination conducted in accordance with the specific requirements for the item being examined including radiographic, ultrasonic, magnetic particle, or dye penetrant inspection. All nondestructive inspection procedures shall conform to AWS D1.1.
 - b. Interpret, record, and report all results of the nondestructive tests.
 - c. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with AWS D1.1.
 - d. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.
 - e. Verify that quality of welds meet the requirements of AWS D1.1.
18. Unless otherwise specified, test all partial and complete penetration welds in connections of beams, girders, columns, trusses, and braces. Test a minimum of 10% of connections with fillet welds. Increase the testing rate for welders having a high rejection rate as required to ensure acceptable welds. Visual inspection is required for all welds. The costs of repairing all defective welds and the costs of retesting by the Testing Laboratory providing services for the Owner shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory to investigate a suspected weld defect, such cost shall be borne by the Contractor.
- D. Field Inspections and Tests: The Testing Laboratory providing services for the Owner shall provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The following tests and inspections shall be made:
1. Obtain the planned erection procedure, and review with the Erectors supervisory personnel.
 2. Check the installation of base plates for proper leveling, grout type, and grout application.
 3. Verify field welding procedures and obtain welder certificates.
 4. Check steel as received in the field for possible shipping damage, workmanship, and piece marking.
 5. Check plumbness and frame alignment as erection progresses.
 6. Check camber of a representative sample of floor beams in an unstressed state immediately after steel is delivered to the site to determine the difference between the camber applied in the shop and the remaining camber in the field prior to erection.
 7. Check camber of a representative sample of floor beams with similar loads and spans after erection but before concrete floor slab placement. Check the same beams for residual camber left after the slab is placed.
 8. Submit a report on camber to the Engineer listing the results of the checks made on camber in the shop, in the field before erection, and in the field after erection both before and after slab placement.
 9. Check joint preparation and fit up, backing strips, and runout plates for welded moment nm q[;
 10. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.

11. Review welding sequence.
12. Visually inspect all field welding for size, length, and quality.
13. Perform nondestructive examination services for various weldments of field erection determined in consultation with the Structural Engineer prior to the start of erection. The Laboratory shall furnish a qualified technician with the necessary equipment to perform radiographic, ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested and other duties as outlined for shop inspection in the previous Section. Unless specified otherwise, check all partial and complete penetration welds in connections of beams, girders, columns, trusses, and braces. Check 10% of connections with fillet welds. Visual inspection is required for all welds.
14. Perform pre-installation verification testing of the pre-tensioning method to be used in the field in accordance with the requirements of the "Specification for Structural Joints Using ASTM A325 and A490 Bolts". Daily check calibration of impact wrenches used in field bolted connections.
15. Inspect bolting operations for all high strengthfield bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
16. Perform Arbitration Testing and Inspection according to procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph above.
17. Visually inspect the welding or other attachment method of metal deck to the structure.
18. Visually inspect 100% of completed shear connectors in each beam and perform bend tests as required according to inspection procedures outlined in AWS D1.1. In addition, perform field bend tests on an additional 2% of completed shear connectors in each beam but not less than one connector per beam.

The costs of repairing all defective welds and the costs of retesting by the Testing Laboratory providing services for the Owner shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory providing services for the Owner to investigate a suspected weld defect, such cost shall be borne by the Contractor.

E. Tests and Inspection of Sprayed-On Fireproofing:

1. The Testing Laboratory providing services for the Owner shall confirm that sprayed-on fireproofing conforms to all performance criteria as specified in the project specifications by obtaining and reviewing manufacturer's certification or test reports.
2. The Testing Laboratory providing services for the Owner shall sample sprayed-on fireproofing at each floor for each day's operation and verify oven-dry density (ASTM E605) and adhesion/cohesion (ASTM E736) as specified on the drawings.
3. The Testing Laboratory providing services for the Owner shall verify proper installation method, proper material, and proper material thickness (ASTM E605) for each day's operation. The thickness of fireproofing shall be as specified in the UL designation numbers on the Architectural Drawings.

END OF SECTION

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.

1.02 TEMPORARY UTILITIES - SEE SECTION 01 51 00

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; DSL modem or faster.
 - 4. Email: Account/address reserved for project use.
 - 5. Mobile Device: One minimum.
- C. Contractor will pay for own telecommunications services.
- D. WiFi Access: Provide WiFi for use by Architect and Engineer until time of Substantial Completion.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 SECURITY

- A. Provide security and facilities to protect Work, and Contractor's operations from unauthorized entry, vandalism, or theft.

1.09 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location established by Architect .
- C. No other signs are allowed without Owner permission except those required by law.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 51 00
TEMPORARY UTILITIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from utility source.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- D. Provide main service disconnect and over-current protection at convenient location and meter.
- E. Permanent convenience receptacles may be utilized during construction.
- F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide and maintain 1 watt/sq ft (10.8 watt/sq m) lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft (2.7 watt/sq m) H.I.D. lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

- A. Cost of Energy: By Contractor.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY COOLING

- A. Cost of Energy: By Contractor.
- B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- C. Maintain maximum ambient temperature of 80 degrees F (26 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

1.07 TEMPORARY VENTILATION

- A. Cost: By Contractor.
- B. Utilize appropriate ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.08 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections.
Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 52 13
FIELD OFFICES AND SHEDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary field offices for use of Contractor.
- B. Maintenance and removal.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove at completion of Work.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.
- D. Exterior Materials: Weather resistant, finished in one color.
- E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
- F. Lighting for Offices: 50 fc (538 lx) at desk top height, exterior lighting at entrance doors.
- G. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Telephone: As specified in Section 01 50 00.
- C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- D. Other Furnishings: Contractor's option.
- E. Equipment: Six adjustable band protective helmets for visitors, one 10 inch (250 mm) outdoor weather thermometer .

PART 3 EXECUTION

3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

This page intentionally left blank

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus; 2021.
- B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2021.
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015 (Reapproved 2023).
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile; 2021.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2015.
- J. NCDENR Erosion Control Handbook NC Department of Environment and Natural Resources.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of NC Erosion and Sedimentation Control Manual.
- C. Comply with all requirements of NC DENR for erosion and sedimentation control .
- D. Runoff Calculation Standard for Urban Areas: USDA TR-55.
- E. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- F. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Owner will obtain permits and pay for securities required by authority having jurisdiction.
 - 2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.

- G. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 10 years.
- I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- M. Open Water: Prevent standing water that could become stagnant.
- N. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:

1. Straw or hay.
 2. Wood waste, chips, or bark.
 3. Erosion control matting or netting.
 4. Cutback asphalt.
 5. Polyethylene film, where specifically indicated only.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Bales: Air dry, rectangular straw bales.
1. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet (1 m) long:
1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot (1.98 kg per linear m).
 2. Wood, 2 by 2 inches (50 by 50 mm) in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
 2. Permittivity: 0.05 sec⁻¹, minimum, when tested in accordance with ASTM D4491/D4491M.
 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 8. Manufacturers:
 - a. TenCate: www.tencate.com/#sle.
 - b. North American Green: www.nagreen.com/#sle.
 - c. Propex Geosynthetics: www.geotextile.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:
1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot (1.98 kg per linear m).
 2. Softwood, 4 by 4 inches (100 by 100 mm) in cross section.
- G. Gravel: See Section 32 11 23 for aggregate.
- H. Riprap: See Section 31 37 00.
- I. Concrete: See Section 03 30 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As shown on plan.
 - 2. Length: As shown on plan.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart (at maximum of 60 m apart).
 - e. Across the entrances to culverts that receive runoff from disturbed areas.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet (30 m)..
 - b. Slope Between 2 and 5 Percent: 75 feet (23 m).
 - c. Slope Between 5 and 10 Percent: 50 feet (15 m).
 - d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
 - e. Slope Over 20 Percent: 15 feet (4.5 m).
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches (150 mm).
 - 2. Place and compact at least 6 inches (150 mm) of 1 1/2 to 3 1/2 inch (40 to 90 mm) diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 - 5. Repair/re-Install silt fence with top of fabric at nominal height and embedment as specified.

6. Embed bottom of fabric in a trench on the upslope side of fence, with 6 inches (150 mm) of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
 7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
 8. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch (19 mm) diameter flat or button head, 1 inch (25 mm) long, and 14 gauge, 0.083 inch (2.11 mm) shank diameter.
 - b. Five staples per post with at least 17 gauge, 0.0453 inch (1.150 mm) wire, 3/4 inch (19 mm) crown width and 1/2 inch (12 mm) long legs.
 9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 2. Install bales so that bindings are not in contact with the ground.
 3. Embed bales at least 4 inches (100 mm) in the ground.
 4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 5. Fill gaps between ends of bales with loose straw wedged tightly.
 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre (6350 kg per hectare); anchor using dull disc harrow.
 2. Wood Waste: Apply 6 to 9 tons per acre (15,200 to 20,800 kg per hectare).
 3. Asphalt: Apply at 1200 gallons per acre (11,000 L per hectare).
 4. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches (100 to 150 mm) depth.
 2. Wood Waste: Apply 2 to 3 inches (50 to 75 mm) depth.
 3. Erosion Control Matting: Comply with manufacturer's instructions.
- F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
 5. Incorporate fertilizer into soil before seeding.
 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.

3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Project informational signs.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Responsibility to provide signs.

1.03 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr (80 km/hr) wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch (19 mm) thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign each of construction, design, and content indicated on drawings, location to be designated by Architect.
 - 1. Job Sign shall be two sided "sandwich" construction over posts.
- B. Content - As shown on plans and:
 - 1. Project number, title, logo and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of Architect and Consultants.
 - 3. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: As shown on plans.

2.03 PROJECT INFORMATIONAL SIGNS

- A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot (30 m) distance.
- B. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
- C. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

- B. Erect at location of high public visibility adjacent to main entrance to site.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Notice to Proceed.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS**2.01 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions:
Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

- E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Provide off-site storage and protection when site does not permit on-site storage or protection.
- H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- I. Comply with manufacturer's warranty conditions, if any.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

This page intentionally left blank

**SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.03 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.04 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Perform dewatering activities, as required, for the duration of the project.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect seven days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Design-Builder, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Control datum for survey is that indicated on drawings.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Building foundation, column locations, ground floor elevations.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- D. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 - 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 - 3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
- E. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- F. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- G. Clean existing systems and equipment.
- H. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

- I. Do not begin new construction in alterations areas before demolition is complete.
- J. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative 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 start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, area drains, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
- B. Substantial Completion.

1. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
 2. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
 3. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
 4. Submit necessary warranties, bonds, maintenance agreements, final certifications and similar documents as warranted by the project.
 5. Obtain and submit releases enabling Owner use of the space; include necessary permits and similar releases.
 6. Change construction cores to permanent cores and deliver keys to owner.
 7. Complete start-up testing of systems, operating instructions for owner's assigned personnel.
 8. Complete final cleaning and touch-up requirements.
 9. Provide copy of contractor's completed punch list.
 - a. Contractor is responsible for completing his own punch list prior to inspection.
 10. Accompany Architect on preliminary final inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
 11. Architect will proceed with inspection or notify contractor of discrepancies.
 - a. Architect will suspend inspection in the event that the project is found not to be ready for inspection.
 12. Architect will prepare Certificate of Substantial Completion following inspection and correction of any deficiencies.
- C. Final Inspection/Acceptance.
1. Notify Architect when project is complete.
 2. Final inspection will not be scheduled until all contracts are completed unless approved otherwise or allowed by exception in General Conditions.
 3. Notify Architect that punch list items have been corrected and project is ready for a final formal inspection.
 4. Architect will certify in writing that all punch list items have been completed and schedule formal final inspection with the Owner.
 5. The Architect will furnish written notice of the final formal inspection not less than seven (7) days prior to the inspection.
 6. Architect will coordinate Final Formal inspection with all parties.
 7. Upon acceptance of project by the Owner the Architect will provide Certificate of Compliance.
- D. Owner will occupy all of the building as specified in Section 01 10 00.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL**1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- B. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- C. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- D. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- G. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- H. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

END OF SECTION

This page intentionally left blank

**SECTION 01 78 00
CLOSEOUT SUBMITTALS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Final Acceptance or Beneficial Occupancy, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Final Acceptance or Beneficial Occupancy, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.

- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- L. Include test and balancing reports.
- M. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Final Acceptance or Beneficial Occupancy.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

**SECTION 01 79 00
DEMONSTRATION AND TRAINING****PART 1 GENERAL****1.01 SUMMARY**

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Conveying systems.
 - 6. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Contractor.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.03 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 DEMONSTRATION - GENERAL**

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.

- 10. Review spare parts and tools required to be furnished by Contractor.
- 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

This page intentionally left blank

**SECTION 02 41 00
DEMOLITION****<<<< UPDATE NOTES****PART 1 GENERAL****2.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.
- C. Abandonment and removal of existing utilities and utility structures.

2.02 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

2.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

2.04 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 3 EXECUTION**3.01 DEMOLITION**

- A. Remove portions of existing buildings in the following sequence:
- B. Remove paving and curbs required to accomplish new work.
- C. Remove all other paving and curbs as indicated on drawings.
- D. Within area of new construction, remove foundation walls and footings to minimum 2 feet (600 mm) below finished grade.
- E. Outside area of new construction, remove foundation walls and footings to minimum 2 feet (600 mm) below finished grade.
- F. Remove concrete slabs on grade as indicated on drawings.
- G. Remove other items indicated, for disposal.
- H. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with requirements in Section 01 70 00.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.

2. Comply with applicable requirements of NFPA 241.
 3. Use of explosives is not permitted.
 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 5. Provide, erect, and maintain temporary barriers and security devices.
 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

- B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- C. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
- D. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

This page intentionally left blank

**SECTION 03 15 00
CONCRETE ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of PVC joint cap for expansion joints.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Submit manufacturer's product data and application instructions.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. W. R. MEADOWS, INC.: www.wrmeadows.com.
- B. BoMetals, Inc.: www.bometals.com.
- C. Chaney Enterprises: www.chaneyenterprises.com.
- D. Substitutions: See Section 01 60 00 – Product Requirements.

2.02 MATERIALS

- A. Expansion Joint Cap: Made of long-lasting PVC that is non-corrosive, flexible, and compatible with expansion joint fillers and joint sealants to provide an effective expansion and contraction joint system.
- B. Product: SNAP-CAP Expansion Joint Cap by W. R. MEADOWS Basis of Design or approved substitution.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive expansion joint cap. Notify architect if surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.
- B. Prior to installation, ensure compatibility of materials to be in contact with expansion joint cap.

3.02 INSTALLATION

- A. Install at all exterior locations where indicated on drawings and where expansion joints abut the building.
- B. Slide expansion joint cap over the top of the expansion joint filler.
- C. Place the concrete and screed to finish grade.
- D. When concrete is cured, insert a screwdriver through the top of expansion joint cap, pull free and discard.
- E. Apply compatible joint sealant according to joint sealant manufacturer's instructions.

END OF SECTION

This page intentionally left blank

SECTION 03 2000

MILD REINFORCING FOR CONCRETE

PART 1 GENERAL

1.01 SCOPE

Provide all materials, equipment, transportation, and facilities, and perform labor necessary for the installation of all concrete reinforcing as shown on the drawings.

Comply with all recommendations of soils and structural engineer's specification regarding protection from corrosive soils or soils containing sulfates and expansive soils.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Documents affecting the work of this section include, but are not necessarily limited to, General Conditions, Conditions Supplementary, and Sections in Division 1 of the Specifications.
- B. Testing – Refer to Section 013410
- C. Concrete Footings – Refer to Section 03300
- D. Auger Cast Piles – Refer to Section 031625
- E. Concrete Framework – Refer to Section 031000
- F. Structural Concrete – Refer to Section 033000
- G. Pre-Cast Structural Concrete – Refer to Section 034100
- H. Refer to Foundation Engineer's specifications for additional concrete reinforcing requirements. Should these specifications exceed the requirements set forth herein, the more stringent requirements shall govern. Discrepancies between these specifications and the Foundation Engineer's specifications shall be coordinated with and approved by the Architect prior to commencing Work.

1.03 QUALITY ASSURANCE

- A. Contractor will be held to have carefully examined all of the Contract Documents including all pertinent details prior to construction of forms for the various parts of the buildings.
- B. Pre-installation Conference shall be scheduled at least 7 days prior to beginning concrete work. The meeting attendees shall include the General Contractor, Subcontractors, and Engineer to review the proposed mix designs and to discuss the required methods and procedures to produce concrete quality concrete construction. This conference will review the submittals and their approval status including the coordination of the concrete work with other trades. The Contractor and Subcontractor will have verified the availability of all materials as well as review the plan and schedule for delivering the materials to the site.
- C. Reference Standards

1. American Concrete Institute
 - a. ACI 318, Building Code Requirements for Reinforced Concrete
 - b. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures
2. Concrete Reinforcing Steel Institute, CRSI, Manual of Standard Practice
3. American Society for Testing and Materials
 - a. ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
 - b. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - c. ASTM A706 Standard Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement.
 - d. ASTM A153 Standard Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware.
4. AWS D1.4, “Structural Welding Code”
5. ASTM E-1155, “Standard Test Method for Determining Floor Flatness and Levelness Using the F-number System.”

1.04 SUBMITTALS

- A. Shop Drawings
 1. Submit shop drawings and installation drawings for all foundations for review by the Architect and Foundation Engineer. Shop drawings shall indicate details of bendin, bar lengths, and placement requirements, and methods and hardware for support and spacing of bars.
 2. Notes given on Drawings relating to placement of bars shall be reproduced on installation drawings.
 3. Review of shop drawings will be for bar sizes, spacings, and general detail only. Quantities, lengths, and fit of materials are Contractor’s responsibility.
- B. Test Reports
 1. Mill Test Reports: Certified copies, evidencing compliance with the requirements of specifications, shall be delivered to Architect with the deliveries of reinforcing steel.
 2. Submit copies of laboratory testing and inspection reports in accordance with the Section 013410.

PART 2 PRODUCTS

2.01 PRODUCT, DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to the project site in bundles which are clearly marked with the metal tags indicating bar sizes, lengths, and designated portion of work. Bundles shall be limited to one size and one length, and each bundle shall be tagged with metal tags.

- B. Stockpile reinforcing off the ground in a dry area supported on wood blocking or similar to prevent contamination until it is utilized on the project. Reinforcing steel shall be stacked in tiers. Care shall be exercised to maintain reinforcement free of dirt, mud, paint, rust, and other foreign material.

2.02 MATERIALS

- A. Reinforcing
 - 1. Bars shall be new deformed billet steel conforming to requirements of ASTM A615. Grades of steel for various sizes and conditions are given on the drawings. Reinforcing Bars: ASTM A615, Grade 60, deformed bars. Epoxy coated rebar to be used at all horizontal exposed structural slabs that will be subjected to salts and at coastal areas.
 - 2. Welded wire mesh shall conform to ASTM A185.
 - 3. Spirals shall be smooth bars conforming to ASTM A615 Grade 60.
 - 4. Reinforcing bars to be welded to structural steel shall conform to the ASTM A706 Grade 60.
 - 5. Supports for Reinforcing: Bolsters Chairs, Spacers, comply with CRSI.
 - 6. Steel Wire: ASTM A82, 16 Ga., Plain cold drawn steel.
 - 7. Deformed Bar Anchors: ASTM A496, 75,000 PSI yield strength.
 - 8. Dowel Bar Sleeves: Plastic, 1/16 inch larger than diameter.
 - 9. Fiber Reinforcing: ASTM C1116, Type III, "Fibermesh" not less than 3/4 inch in length and diagnosed for secondary reinforcement of concrete slabs and proportionally mixed in concrete mix at 1 ½ bags minimum per cubic yard unless noted otherwise in accordance with the manufacturer's recommendations.

2.03 CONCRETE ACCESSORIES

- A. Concrete accessories including bar supports, chairs, and spacers shall be of cold-drawn wire and shall be fabricated in accordance with the requirements of ACI 315 Chapter 7, with heights, as required. Bar supports for concrete testing on earth shall be pre-cast concrete bricks having imbedded tie wires or shall be "individual high chairs" with welded plates on bottom as manufactured by Hohmann and Barnardm, Inc. Bar supports to be used where concrete will be exposed shall be hot-dipped galvanized or shall have plastic tips.

2.04 COATINGS

- A. Rust inhibitor for field application to metal accessories shall be "Hi-Build Epoxoline" manufactured by the Tnemee Co., Kansas City, Missouri, or other material as approved by the Architect.
- B. Hot-dip galvanizing shall conform to ASTM A153.
- C. Field repair of galvanizing shall be done with or equal to "Z.R.C. Cold Galvanizing Compound", by ZRC Chemical Products CO., Quincy, Mass, or equal.

PART 3 EXECUTION

3.01 GENERAL

- A. Reinforcing steel of sizes, shapes, lengths, spacing, and other dimensions shown shall be placed where shown on the drawings, Details of reinforcing shall conform to ACI 318.

3.02 CLEANING

- A. Reinforcement shall be thoroughly cleaned of rust, mill scale, dirt, oil or other coatings which might tend to reduce bending of reinforcing to concrete.

3.03 BENDING

- A. Bars shall be bent cold. Heating or reinforcement, or handling by makeshift methods, will not be permitted. Bars having kinks or bents not required shall not be used.

3.04 PLACING

- A. Reinforcement shall be accurately placed and securely saddle tied at every other intersection with No. 18 gauge black annealed wire, and shall be rigidly held in place by means for metal chairs or spacers during placement of concrete.
- B. Bars in concrete wall shall be held in position and to proper clearance by means of concrete or metal spacers made especially for locations where spacers are required.
- C. Bars in beams and slabs shall be held to correct location during placing of concrete by spacers, chairs, or other necessary supports with the following tolerances:
 - 1. Top bars in slabs and beams
 - a. Members 8 inches deep or less: + ¼ inch
 - b. Members more than 8 inches deep but not over 2 feet deep: +1/2 inch
 - c. Members more than 2 feet deep: +1 inch
 - 2. Lengthwise of members: +2 inches
 - 3. Concrete cover to formed surfaces: +1/4 inch
 - 4. Minimum spacing between bars: ½ inch
- D. Bar supports shall not be placed against exposed faces of precast beams, columns, walls, or copings.
- E. Tie wires shall not be in contact or within 1 – ½” of exposed surfaces.
- F. Reinforcement in slabs on grade shall be statically supported on appropriate spacers, chairs, or other approved supports. Hooking and lifting of reinforcement during concrete placement will not be permitted.

3.05 TESTING

- A. Upon completion of the reinforcing placement, and prior to placing concrete materials, the Contractor shall provide an independent review of the reinforcing placement, (“pre-pour

inspection), to verify that all reinforcing materials have been installed in accordance with the Contract Documents.

- B. A verbal approval of the reinforcement installation must be provided to the General Contractor prior to pouring the concrete. Any nonconforming items must be corrected prior to pouring concrete.
- C. A written pre-pour inspection report must be filed with the General Contractor, Architect, Structural Engineer, and the Owner, within two weeks of the observation, indicating that all reinforcing materials were installed substantially in accordance with the requirements of the contract documents.
- D. The pre-pour inspection for all “structural” concrete shall be performed by the Structural Engineer, Architect, Testing Laboratory, or other sources approved in writing by the Architect or Engineer.
- E. The pour-inspection for all “nonstructural” concrete, (paving and flatwork), may be performed by the Structural Engineer, Architect, Testing Laboratory, General Contractor or other sources approved in writing by the Architect or Engineer.

END OF SECTION

This page intentionally left blank

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 QUALITY ASSURANCE

Conform to “Specifications for Structural Concrete” ACI 301-05 and the following:

NOTE: All ASTM standards shall reference latest edition.

- A. Allowable Tolerances in Exposed Finished Work
 - 1. In Linear Building Lines, Elevation and Conspicuous Lines and Arises: Maximum 3/16” in 20’-0”; maximum 3/8” in 40’-0” or more.
 - 2. In Cross-Sectional Dimension: 3/16”.
 - 3. In surface Plane, Plumb and Level: 1/8” in 10’-0” in any direction when measured with a 10’-0” straight edge.
- B. Testing Laboratory
 - 1. Concrete testing shall be performed by an independent testing agency selected and paid for by the Owner (or by the Contractor as assigned by the Owner and acceptable to the Architect). Costs for testing shall be included in Contract Sum.
 - 2. Qualifications: Testing agency shall comply with requirements of ASTM E 329-03 and shall be an AASHTO R18 accredited agency.
- C. Testing Laboratories Duties
 - 1. Preparation and/or verification of mix designs for concrete classes specified.
 - 2. Check concrete materials for compliance with specifications and report results and recommendations to Architect.
 - 3. Perform specified laboratory tests. Report results on field test data sheet to architect.
 - 4. Notify Architect immediately of any test specimens that do not meet design compressive strength at 28 days or 2/3 of design strength at seven days.
- D. Duties by the Testing Laboratory Relative to Testing
 - 1. Designate one individual to be responsible for conducting duties relative to testing. Individual will be instructed in his duties by testing agency. Individual shall not be changed without notice to Architect.
 - 2. Delivering of materials to testing agency’s laboratory for use in verifying design mixes.
 - 3. Molding cylinders for compression testing, performing slump tests and air content tests.
 - 4. Advising testing agency of conditions requiring testing and scheduling testing agency’s work.
 - 5. Storing cylinders at project site in storage box for 24 hours after molding.
 - 6. Delivering cylinders to testing agency’s laboratory.

7. Maintaining field test data sheet for each set of concrete specimens. The completed data sheet shall show the following information: laboratory number, date, plant, truck number, time batched, time sampled, air temperature, concrete temperature, inspector, mix design number, required strength, unit weight, air content, slump, locations of placement, 7-day and 28-day strengths.
8. Provide stable, lockable insulated storage box thermostatically controlled to maintain temperature between 60 degrees and 80 degrees F for storage cylinders for first 24 hours after molding. Box shall have minimum capacity of 40 cu. ft. Locate box in a permanent lockable area of approximately 100 sq.ft. Limit access to testing agency personnel and designated agency.

E. Acceptance of Concrete

1. Compressive strength of concrete will be considered satisfactory when: the averages of all sets of three consecutive compressive strength test results molded and cured in accordance with requirements of ASTM C 31/C 31M equal or exceed f'_c ; and no individual strength test result falls below f'_c by more than 500psi when f'_c is 5000 psi or less, or by more than $.10f'_c$ when f'_c is more than 5000 psi. Whenever this criteria is not met, core tests shall be taken in those areas with questionable concrete, as directed by the Architect.

- F. Architect Inspection: Notify Architect at least 48 hours prior to placing concrete to allow for inspection.

1.02 SUBMITTALS

- A. Shop Drawings: Submit for concrete reinforcement. Indicate type, size and location of all reinforcement. Indicate fabrication details. Details not indicated shall comply with ACI 315-99.
- B. Mix Design: Submit for each type and class of concrete.
- C. If Contractor proposes to use curing compound(s) in lieu of the preferred specified wet cure process, then Contractor shall submit a concrete curing compound product data sheets (for approval) and a concrete finishing schedule (for information only) including the following:
 1. Curing compound manufacturer certifications that their proposed products are approved for use with the applicable project floor finishes (for information only).
 2. Floor finish manufacturer approvals of the curing compounds proposed for use under their floor finish (for information only).
 3. Show on floor plan where curing compounds are proposed for use, and what floor finishes are to be applied at those locations (for information only).
 4. If Contractor chooses to use curing compounds that are not compatible with the associated floor finishes, submit proposed methods of removal of curing compounds and approval(s) by associated floor finish manufacturer(s) (for information only).

1.03 DELIVERY, STORAGE AND HANDLING

- A. Mix and transport concrete in accordance with ACI 304R-00.

- D. Delivery tickets to indicate time and date truck leaves the plant and the time the truck is completely unloaded.
- E. No water shall be allowed to be added over and above that indicated in the accepted design mix.

1.03 JOB CONDITIONS

- A. Environmental Conditions:
 - 1. Cold weather concreting shall be in accordance with ACI 306.1-90, “Cold Weather Concreting” when condition at the site tends to impair the quality of freshly mixed or hardened concrete.
 - 2. Hot weather concreting shall be in accordance with ACI 305R-99, “Hot Weather Concreting” when condition at the site tends to impair the quality of freshly mixed or hardened concrete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Formwork:
 - 1. Lumber: Square edge, #2 Grade.
 - 2. Plywood: B-B Plyform – EXT-APA.
- B. Reinforcement
 - 1. Welded Wire Reinforcement: Meeting ASTM A 185-02.
 - 2. Bars: Meeting A615-96a, Grade 60 for bars #3 and larger.
 - 3. Accessories: Galvanized.
 - 4. Supports for Reinforcement:
 - a. Use wire bar type supports complying with CRSI specifications, or concrete bricks. Do not use wood, brick, or other unacceptable materials.
 - b. Provide supports contacting forms with either hot-dipped galvanized or plastic protected legs.
- C. Concrete Materials
 - 1. Portland Cement: Meeting ASTM C 150-04, Type I or III. Only one brand of cement shall be used for all concrete work.
 - 2. Normal Weight Fine Aggregates: Meeting ASTM C 33-03.
 - 3. Normal Weight Coarse Aggregates: Meeting ASTM C 33-03, Size No. 67, Class Designation 1S.
 - 4. Water: Clean, potable.
 - 5. Admixtures:
 - a. Water Reducing Admixture: “Eucon WR-75” by the Euclid Chemical Company, “Pozzolith 220-N” by Master Builders or “Plastocrete” by Sika Corporation. The admixture shall conform to ASTM C 494 Type A, and not contain more chloride ions than are present in municipal drinking water.
 - b. Water Reducing, Retarding Admixture: “Eucon Retarder-75” by the Euclid

- Chemical Company, “Pozzolith 100-XR” by Master Builders or “Plastiment” by Sika Chemical Corporation. The admixture shall conform to ASTM C 494 Type D, and not contain more chloride ions than are present in municipal drinking water.
- c. High Range Water Reducing Admixture (Superplasticizer): The admixture shall conform to ASTM C 494 Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - d. Non-Chloride Accelerator: “Accelguard 80” by The Euclid Chemical Company, “Pozzutec 20” by Master Builders, or “Plastocrete 161FL” by Sika Corporation. The admixture shall conform to ASTM C 494 Type C or E, and not contain more chloride ions than are present in municipal drinking water.
 - e. Air Entraining Admixture: Conforming to ASTM C 260-01.
 - f. Calcium Chloride: Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.
 - g. Certification: Written conformance to above mentioned requirements and the chloride ion content will be required from the admixture manufacturer prior to mix design review by the Architect.
- D. Filler Strips for Expansion Joints: Non-extruding type cane fiber board impregnated with bituminous material.
- E. Curing and Sealing Compound: The compound shall conform to ASTM C-309 30% solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq. cm. when applied at a coverage rate of 300 sq.ft. per gallon. Manufacturer’s certification required. (note: the specified wet cure process is preferred in lieu of curing compounds listed below; see submittal section for additional submittal requirements if the contractor proposes the use of curing compounds)
- 1. Acceptable Products:
 - a. Euclid Chemicals Co., Kyrez DR dissipating type curing compound.
 - b. Or equals as approved by Architect.
- F. Construction Joints for Slabs on Grade: Minimum 24 ga. galvanized steel forming keyed joint full depth of slab. Furnish complete with stake pins.
- G. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide CETCO; Waterstop-RX-101 or RX-101T, or a comparable product by one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; SSW MiraSTOP
 - b. Tremco; Superstop.
- H. Contraction (control) Joints for Slabs on Grade:
- 1. Saw cuts or plastic inserts.
 - 2. Depth: 1” or ¼ slab thickness, whichever is greater.
- I. Polypropylene Fibers: The fibers shall be 100 percent virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as a concrete

secondary reinforcement. The fibers shall be a nominal 1000 denier, and shall be cut to a nominal $\frac{3}{4}$ " in length. The fibers shall conform to ASTM C 1116.

1. Certification: The fiber manufacturer shall certify the above requirements for each project.
2. Application Rate: 1.5 pounds per cubic yard of concrete (0.9 kg/m^3). This shall be documented by the ready-mix operation.

2.02 CONCRETE STRENGTH

- A. Concrete design strength shall be as indicated on the drawings.
- B. Mix Designs shall be in accordance with Method 1 or Method 2 of ACI 301-05.
- C. All concrete shall contain the specified water reducing admixture, water reducing, retarding admixture and/or high range water reducing admixture (superplasticizer). All concrete slabs placed at air temperatures below 50 degrees F° shall contain the specified non-chloride accelerator. All concrete required to be air entrained shall contain an approved air entrained admixture. All pumped concrete, concrete for industrial slabs, concrete required to be watertight and concrete with a water-cement ratio below 0.50 shall contain the specified high range water reducing admixture (superplasticizer).
- D. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5% to 7.5%. All interior slabs subject to abrasion shall have a maximum air content of 3%.
- E. Water-Cement Ratio: All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.50. All concrete required to be watertight and/or subjected to deicers shall have a maximum water-cement ratio of 0.45.
- F. Slump: All concrete containing mid-range water reducing admixture shall have a maximum slump of 7" (+/- 1") unless otherwise approved by the Architect. All concrete containing the high range water reducing admixture (superplasticizer) shall have a maximum slump 11" (+/- 1") unless otherwise approved by the Architect. The concrete shall arrive at the job site at a slump of 3" to 5", to be verified, then the high range water reducing admixture added to increase the slump to the approved level. All other concrete shall have a slump of 3" to 5".
- G. Under no circumstances shall fly ash, slag or other pozzolans be used as a percentage of cementitious materials in any concrete mix intended for use in post-tensioned concrete slabs.
- H. Concrete mixes destined for foundation use could use as much as 30% fly ash or slag as part of their cementitious material.

PART 3 EXECUTION

3.01 FORMS

- A. Earth forms may be used for footing forms where sides of the excavation are cut true, in firm soil.
- B. Forms: Construct to conform to the shape, lines, grades and dimensions indicated. Make forms substantial and sufficiently tight to prevent leakage of liquid and braced or tied together to

maintain position and shape. Forms shall not deflect under the deadload weight of the liquid concrete of construction loads.

- C. Build bulkheads with keys in footings and slabs where necessary to stop concrete placement. Submit locations of construction joints and sequence of pours to Architect for acceptance before starting concrete placement. Form construction joints in slabs using keyed joints; control joints by saw cutting or installation of specified joints.
- D. Apply form release agent to forms immediately prior to placing concrete. Clean forms prior to re-use.
- E. Install waterstops per manufacturer's printed instructions.

3.02 REINFORCEMENT

- A. Metal reinforcement shall be protected by concrete cover. Where not otherwise shown on the drawings, the thickness of concrete over the reinforcement shall be as follows:
 - 1. Where concrete is deposited against ground without the use of forms: Not less than 3".
 - 2. Where concrete is exposed to the weather, or exposed to the ground by placed in forms: Not less than 2" for bars more than 5/8" diameter and 1-1/2" for bars 5/8" or less in diameter.
- B. Lap joints in welded wire reinforcement 8" and extend mesh within 1" of sides and ends of slabs.
- C. Splicing of reinforcement will not be permitted except where shown on drawings.
- D. Cleaning: Clean reinforcement of mill scale and of coatings that would destroy or reduce bond before placing. Where there is delay in depositing concrete after reinforcement is placed, steel shall be reinspected and where necessary recleaned.

3.03 PLACING CONCRETE

- A. Place no concrete until all embedded items and reinforcement have been placed in forms and Architect's acceptance has been obtained. Ample notice shall be given Architect of an impending pour so that he may inspect work prior to placing.
- B. Convey concrete from mixer to place of final deposits by methods that will prevent segregation or loss of material.
- C. Deposit concrete as nearly as practicable to final position to avoid segregation due to rehandling or flowing. Placing shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement. Once placing is started, it shall be carried on as a continuous operation until placement of the section is complete.
- D. Work concrete into forms, around bars and embedded items with spades, rods, trowels, and vibration, so as to produce a solid homogeneous mass, free of pockets, voids and honeycombs.
- E. Make and locate construction joints so as to least impair the strength of the structure. Where a joint is made, clean surface of the concrete and remove laitance. In addition, mechanically roughen, wet and slush vertical joints with coat of neat cement grout immediately before placement of new concrete.

- F. When pouring slab on grade, welded wire fabric shall be properly supported at the required elevation.
- G. Finishing: Finishes for cast-in-place concrete shall be in accordance with ACI 301-99, and as follows:
 - 1. Interior Floor Slabs: Trowel finish.
 - 2. Exterior Slabs, Stairs, and Platforms: Non-Slip Broom finish.
 - 3. Exterior Stair Treads: Abrasive Aggregate Finish.
 - 4. Unexposed Concrete: As-cast rough form finish.
- H. Cure all concrete in accordance with provisions of ACI 301-05. All concrete shall be kept continuously moist and above 50 degrees F. for seven days. The time requirement may be reduced to three days when high early strength concrete is used.

3.04 FIELD QUALITY CONTROL

- A. Compression Tests: Test specimens in accordance with C 39-96, C 172-97 and C 192-02. At project site, prepare cylinders for testing and perform required tests of concrete. Make four cylinders for each sample of concrete to be tested; one to be broken at seven days, two at 28 days for strength compliance, and one held in reserve. If 28-day tests indicate specified strength, reserve cylinder may be discarded.
- B. Core Tests: Core tests, at Contractor's expense, shall be required whenever concrete fails to meet the "Acceptance of Concrete" criteria. Cores shall be taken under the direction of Architect. Criteria for acceptance of cores shall be as described in ACI 318-05, Section 5.6.5. Additional core tests, at Contractor's expense, may be required by Architect whenever other requirements of these specifications are not complied with.
- C. Load Tests: Perform, at Contractor's expense, when core testing is inconclusive or impracticable. Evaluate load tests in accordance with ACI 318-05 and 301-05.
- D. Test for Air Content: Perform each time a set of cylinders is prepared for compression testing. Test in accordance with ASTM C 173-01 for lightweight concrete and ASTM C 231-03 for normal weight concrete.
- E. Slump Test: Perform each time a set of cylinders is prepared for compression testing. Test in accordance with ASTM C 143-03.
- F. Shrinkage Test: Perform only if directed by Architect.

3.05 FREQUENCY OF TESTING

- A. Take samples for compressive strength tests for each class of concrete for each 75 cu.yd. Minimum of one sample for each day of pouring. Minimum of one sample for each class of concrete poured.

3.06 ADDITIONAL TESTING

- A. Perform additional testing of materials to determine compliance with Contract Documents when directed by Architect. Furnish samples and deliver them to testing agency's laboratory.
- B. Additional testing will be paid for as extra work in accordance with Contract Condition.

END OF SECTION

SECTION 03 30 05
MVRA FOR CAST-IN-PLACE CONCRETE

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Moisture vapor reducing admixture (MVRA) for cast-in-place concrete.

1.02 REFERENCE STANDARDS

- A. 302.2R-06 - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring.
- B. ACI 305R - Guide to Hot Weather Concreting; 2010.
- C. ACI 306R - Guide to Cold Weather Concreting; 2016.
- D. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- E. ASTM D5084 - Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter; 2024.
- F. 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; 2024.
- G. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting two weeks prior to the start of the work of this section; require attendance by all affected installers.
 - 1. Review and discuss:
 - a. MVRA project specific quality control procedures.
 - b. Concrete mix designs.
 - c. Procedures for ensuring quality of concrete materials.
 - d. Testing laboratory responsible for concrete design mixtures, sampling and testing.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit MVRA manufacturer approval of proposed concrete mix design.
- D. Material Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Material Test Report: Document that products of this section comply with specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Firm experienced in manufacture of concrete MVRA.
 - 2. Capable of providing test reports indicating compliance with specified performance requirements and with ASTM C494/C494M testing protocols, from independent AASHTO approved laboratory.
 - 3. Able to provide on-site technical assistance if requested.
- B. Ready Mixed Concrete Manufacturer Qualifications:
 - 1. Firm experienced in manufacturing ready-mixed concrete products.
 - 2. Comply with ASTM C94/C94M requirements for production facilities and equipment.
 - 3. Manufacturer certified according to NRMCA certification procedures.
- C. Slab Moisture Testing and Evaluation:
 - 1. Personnel performing laboratory tests: Certified in conduct of ASTM D5084 under supervision of licensed geotechnical engineer.

2. Determination of whether concrete slab is prepared to receive flooring, coatings, or roofing rests with MVRA manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, undamaged containers with labels intact.
- B. Comply with manufacturer's written MVRA handling instructions prior to mixing.
- C. Comply with manufacturer's written MVRA storage instructions.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's lifetime warranty against concrete induced moisture vapor failure, providing coverage for:
 1. Repair or removal of failed flooring or roofing.
 2. Placement of topical moisture remediation system.
 3. Replacement of flooring or roofing materials to match original including material and labor.
- C. Provide manufacturer's adhesion warranty, matching terms of adhesive or primer manufacturer's material adhesion warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ISE Logik Industries, Inc.: www.iselogik.com.
 1. Basis of Design or approved substitution.
- B. Specialty Products Group; Vapor Lock 20/20: www.spggogreen.com
- C. Avecs; Pro-Act: www.avecs.build
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MOISTURE VAPOR REDUCING ADMIXTURE

- A. Concrete Moisture Vapor Reduction Admixture (MVRA):
 1. Non-toxic, volatile organic compound (VOC) free, liquid admixture formulated to react with hydroxide ions produced by cement hydration process, creating additional hydration products within capillary pores, blocking moisture vapor movement through concrete.
 2. Physical characteristics:
 - a. Hydraulic conductivity: Project specific maximum of 6.0 E-8 cm/s per ASTM D5084.
 - b. Toxicity: None.
 - c. Odor: None.
 - d. Flammability: None.
 - e. Volatile Organic Compound (VOC) content: 0 grams per liter.
 - f. Freeze temperature: 32 degrees F (0 degrees C).
 - g. pH: 11.3.
- B. Product: MVRA 900 by ISE Logik Industries Basis of Design or approved substitution.

2.03 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: See Section 07 26 00.

2.04 MIXING

- A. Moisture Vapor Reducing Admixture (MVRA) for new concrete, slabs below grade, slabs on grade, elevated slabs, roof deck, stair treads and landings, and exterior balconies.
- B. Add MVRA 900 to concrete mix in accordance with manufacturer's instructions.
- C. Add MRVA 900 directly to freshly mixed concrete at end of the batch process with tail water.
- D. Ready-Mixed Concrete:
 1. Measure, batch, mix, and deliver concrete with MVRA 900 in accordance with ASTM C94/C94M.

2. Furnish batch ticket information showing dosage of MVRA 900.
- E. Site Mixing:
 1. Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M.
 2. Add MVRA 900 to where it makes direct contact with ready mix, then rotate drum of batch truck on high for at least seven minutes prior to discharge.
- F. Freshening onsite with held back mix water is acceptable if in accordance with ACI guidelines and if amount does not exceed original water to cementitious material ratio or instructions of Structural Engineer.
- G. Use water reducing admixtures to achieve desired slump.
- H. Use of other admixtures in same batch as MVRA 900 is acceptable if each admixture is added separately.
- I. Do not use shrink reducing admixtures.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Dispense MVRA according to mix design and supplier's written instructions.
- B. Add MVRA to concrete according to manufacturer's written instructions.
- C. Place and cure concrete as specified in Section 03 30 00.

3.02 CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306R-10 for cold-weather protection and ACI 305R-10 for hot-weather protection during curing.
- B. Cure concrete slabs to receive moisture sensitive coatings according to ACI 302.2R-06 by one or more of following methods:
 1. Moisture-retaining cover curing.
 2. Self-dissipating curing compound.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. MVRA 900 Manufacturer: Pre-test manufactured production lots for conformance with published limits of hydraulic conductivity per ASTM D5084 prior to shipping.
- C. Project specific quality control process required by MVRA manufacturer necessary to convey concrete moisture vapor emission flooring failure warranty and stand-alone adhesion warranty.
- D. Project team: Upon request, provide batch tickets indicating presence and dosage of MVRA in mix.

END OF SECTION

This page intentionally left blank

**SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Architectural precast concrete components indicated on plans.
- B. Architectural precast concrete accessories.
- C. Supports, anchors, and attachments.
- D. Grouting under panels.

1.02 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- E. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- G. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- I. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- J. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.
- K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- L. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; 2013.
- M. PCI MNL-120 - PCI Design Handbook; 2017, with Errata (2021).
- N. PCI MNL-122 - Architectural Precast Concrete; 2007.
- O. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.
- P. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
- C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials.

- D. Samples: Submit two verification, 12 by 12 inch (300 by 300 mm) in size, illustrating surface finish, color and texture.

1.05 QUALITY ASSURANCE

- A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.
- B. Fabricator Qualifications:
 - 1. Firm having at least 2 years of documented experience in production of precast concrete of the type required.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handling: Lift and support precast units only from support points.
- B. Protect units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 PRECAST UNITS, GENERAL

- A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI CODE-318.
 - 1. Concrete Face Mix: Minimum 5000 psi (34 MPa), 28 day strength, air entrained to 5 to 7 percent; comply with ACI SPEC-301.
 - 2. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
 - 3. Calculate structural properties of units in accordance with ACI CODE-318.
 - 4. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 5. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.
- B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.
 - 1. Acid etched limestone simulated appearance.
 - 2. Finish all exposed surfaces to match face surface finish.
 - 3. Finish unexposed surfaces to as-cast finish.
- C. Finish Type ____: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.
 - 1. Honed limestone simulated appearance.
 - 2. Finish all exposed surfaces to match face surface finish.
 - 3. Finish unexposed surfaces to as-cast finish.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa).
 - 1. Deformed billet-steel bars.
 - 2. Galvanized in accordance with ASTM A767/A767M, Class I.
- B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Structural Aggregates: ASTM C33/C33M.
- C. Lightweight Structural Aggregate: ASTM C330/C330M.
- D. Surface Finish Aggregate: Complying with sample in office of Architect.

- E. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 - 1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
 - 2. Color(s): As selected by Architect from manufacturer's full range.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Air Entrainment Admixture: ASTM C260/C260M.
- H. Grout:
 - 1. Non-shrink, non-metallic, minimum 10,000 psi (70 MPa), 28 day strength.

2.04 SUPPORT DEVICES

- A. Connecting and Support Devices; Anchors and Inserts: ASTM A666 Type 304 stainless steel.
 - 1. Clean surfaces of rust, scale, grease, and foreign matter.

2.05 FABRICATION

- A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.
- B. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.

2.06 FABRICATION TOLERANCES

- A. Comply with PCI MNL-117 and PCI MNL-135.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace or repair damaged panels.
- B. Erect units level and plumb within allowable tolerances.
- C. Align and maintain uniform horizontal and vertical joints as erection progresses.
- D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.
- E. Fasten units in place with mechanical connections.
- F. Provide non-combustible shields during welding operations.

3.04 TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135.

END OF SECTION

This page intentionally left blank

**SECTION 03 49 00
GLASS-FIBER REINFORCED CONCRETE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Architectural precast glass-fiber-reinforced concrete columns.
- B. Supports, anchors, and attachments.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- D. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- E. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. PCI MNL-128 - Recommended Practice for Glass Fiber Reinforced Concrete Panels; 2001.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
- C. Shop Drawings: Indicate locations, layout, fabrication details, reinforcement, connection details, dimensions, and relationship to adjacent materials. Provide erection drawings.
- D. Samples: Submit two samples 6 inch (150 mm) by 6 inch (150 mm) in size illustrating surface color, finish and texture.
- E. Manufacturer's Installation Instructions: Indicate surface cleaning instructions.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.

1.06 PROJECT CONDITIONS

- A. Coordinate the Work with installation of backup supporting structure, application of joint sealers.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle units to position, consistent with their shape and design. Lift and support only from support points.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Glass-Fiber-Reinforced Concrete:
 - 1. Premier Stoneworks, LLC: www.premier-stoneworks.com/#sle.
 - 2. Stromberg Architectural Products, Inc: www.strombergarchitectural.com/#sle.
 - 3. Melton Classic, Inc.: www.meltonclassics.com.
 - a. FiberCrete GFRC Column Basis of Design or approved substitution.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GLASS-FIBER-REINFORCED CONCRETE UNITS

- A. Glass-Fiber-Reinforced Concrete Units: Factory-fabricated, using rigid molds, constructed to maintain unit panel uniform in shape, size and finish.
 1. Design and fabricate to comply with applicable codes.
 2. Design to withstand dead loads, positive and negative wind loads, and erection forces.
 3. Control deflection of units to maintain fit with adjacent construction and openings within their tolerances.
 4. Design connections to accommodate building movement without damage to components, wracking of joint connections, breakage of seals, or moisture penetration.
 5. Allow for adjustment of connections to accommodate misalignment of structure without permanent distortion.
 6. Concrete Mix: Of strength to accommodate panel configuration, panel size and weight, and manufacturing criteria, air entrained.
 7. Surface Burning Characteristics: Flame spread index of 5 or less; smoke developed index of 20 or less; when tested in accordance with ASTM E84.
 8. Welding: Comply with AWS D1.1/D1.1M.
 9. Appearance: Ensure exposed-to-view finish surfaces of units are uniform in color and appearance.
 10. Finish of Exposed-to-View Precast Unit Surfaces: Match adjacent cast-in-place concrete finish.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M Portland Type I - Normal; white color.
- B. Concrete Aggregates: ASTM C33/C33M.
- C. Reinforcement: Alkali resistant chopped glass fiber rovings specifically formulated for use in concrete, with lengths varying from 1-1/2 to 2 inches (38 to 51 mm).
- D. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 1. Color(s): As selected by Architect from manufacturer's full range.

2.04 SUPPORT DEVICES

- A. Connecting and Support Devices: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.

2.05 FABRICATION

- A. Spray-up concrete mix in multiple passes; maintain consistent quality during manufacture.
- B. Place metal framing members in position in mold.
- C. Embed anchors, inserts, plates, angles, and other cast-in items as indicated on shop drawings.
- D. Fabricate connecting devices, items fit to framing members, fasteners and accessories necessary for proper installation.
- E. Locate hoisting devices to permit device removal after erection.
- F. Cure units to minimize appearance blemishes such as non-uniformity, staining or surface cracking.
- G. Identify each unit with corresponding code on erection drawings, in location not visible in finish work.
- H. Exposed Non-Galvanized Steel Components: Clean surfaces of rust, scale, grease, and foreign matter; prime paint in one coat, except surfaces in direct contact with concrete or requiring field welding.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate installation with structural supports, backup, and opening framing, if any.
- B. Install units without damage to shape or finish. Replace or repair damaged panels.

- C. Install units level and plumb within allowable tolerances.
- D. Align and maintain uniform horizontal and vertical joints as erection progresses.
- E. Site cutting of panels not permitted.
- F. Fasten units in place with mechanical connections.

3.02 TOLERANCES

- A. Maximum Variation from Plane of Location: 1/4 inch in 10 feet and 3/8 inch in 100 feet (6 mm in 3 m and 9 mm in 30 m), non-cumulative.
- B. Maximum Offset from True Alignment Between Two Connecting Units: 1/4 inch (6 mm).
- C. Variation From Dimensions Indicated on Shop Drawings: Plus or minus 1/8 inch (3 mm).
- D. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch (3 mm).

3.03 CLEANING

- A. Clean units according to manufacturer's written instructions.
 - 1. Remove dirt, stains, and residue.
 - 2. Protect adjacent materials during cleaning.

3.04 PROTECTION

- A. Protect installed units from damage.

END OF SECTION

This page intentionally left blank

**SECTION 04 05 11
MASONRY MORTARING AND GROUTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Mortar for masonry.
- B. Grout for masonry.

1.02 REFERENCE STANDARDS

- A. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2024.
- B. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- I. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- K. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2025.
- L. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.
- E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS**2.01 MORTAR AND GROUT APPLICATIONS**

- A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.
- B. Mortar Color:
 - 1. Masonry: Natural gray unless otherwise indicated.
 - 2. Brick: Color as selected by Architect from manufacturer's full range.
- C. Mortar Mix Designs: ASTM C270, Property Specification.
 - 1. Salvaged Exterior Masonry Veneer: Type O; color to match existing.
 - 2. Masonry below grade and in contact with earth: Type S.
 - 3. Exterior Masonry Veneer: Type N.
 - 4. Exterior Cavity Walls: Type S mortar with Type N pointing mortar.
 - 5. Exterior, Load-bearing Masonry: Type N.
 - 6. Exterior, Non-loadbearing Masonry: Type N.
 - 7. Interior, Load-bearing Masonry: Type N.
 - 8. Interior, Non-loadbearing Masonry: Type O.
- D. Grout Mix Designs:
 - 1. Bond Beams and Lintels: 3,000 psi (21 MPa) strength at 28 days; 8-10 inches (200-250 mm) slump; provide premixed type in accordance with ASTM C 94/C 94M.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

2.02 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: Standard gray.
- B. Portland Cement: ASTM C150/C150M.
 - 1. Type: Type I - Normal; ASTM C150/C150M.
 - 2. Color: Color as required to produce approved color sample.
- C. Masonry Cement: ASTM C91/C91M.
 - 1. Type: Type N; ASTM C91/C91M.
 - 2. Colored Mortar: Premixed cement as required to match Architect's color sample.
- D. Hydrated Lime: ASTM C207, Type S.
- E. Quicklime: ASTM C5, non-hydraulic type.
- F. Mortar Aggregate: ASTM C144.
- G. Grout Aggregate: ASTM C404.
- H. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): As selected by Architect from manufacturer's full range.
- I. Water: Clean and potable.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

- D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- E. Do not use anti-freeze compounds to lower the freezing point of mortar.
- F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

- A. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Work grout into masonry cores and cavities to eliminate voids.
- C. Do not install grout in lifts greater than 16 inches (400 mm) without consolidating grout by rodding.
- D. Do not displace reinforcement while placing grout.
- E. Remove excess mortar from grout spaces.

3.03 GROUTING

- A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.
- B. Low-Lift Grouting:
 - 1. Limit height of pours to 12 inches (300 mm).
 - 2. Limit height of masonry to 16 inches (400 mm) above each pour.
 - 3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
 - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
 - 2. Place grout for spanning elements in single, continuous pour.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.
- B. Test and evaluate mortar in accordance with ASTM C780 procedures.
- C. Test and evaluate grout in accordance with ASTM C1019 procedures.

END OF SECTION

This page intentionally left blank

**SECTION 04 20 00
UNIT MASONRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Clay facing brick.
- C. Reinforcement and anchorage.
- D. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- H. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- I. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
- J. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2021.
- K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.
- N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2021.
- O. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- Q. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- R. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- S. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- T. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- U. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.
- V. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- W. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- X. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls; 2025.

- Y. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- Z. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).
- AA. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Fire Rated Assemblies: Comply with applicable code for UL (FRD) Assembly No. as delineated in the plans.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum five years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
 - 2. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 3. Special Shapes: Provide nonstandard blocks configured for corners.
 - 4. Load-Bearing Units: ASTM C90, lightweight.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture.
 - 5. Nonloadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Lightweight.

2.02 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBX, Grade MW.
 - 1. Color and texture to match Architect's approved sample.
 - 2. Nominal size: As indicated on drawings.
 - 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 05 11.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Heckmann Building Products, Inc.: www.heckmannbuildingprods.com.
 - 2. Blok-Lok Limited: www.blok-lok.com/#sle.
 - 3. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - 4. WIRE-BOND www.wirebond.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed billet bars; galvanized.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder, with adjustable ties spaced at 16 in (406 mm) on center.
 - 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm) wire, width of components as required to provide not less than 5/8 inch (16 mm) of mortar coverage from each masonry face.
 - 4. Vertical adjustment: Not more than 1 1/4 inches (32 mm).
- F. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch (4.8 mm) thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in (32 mm).
- G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
- H. Provide anchoring system that complies with ACI 530.1/ASCE 6/TMS 602.
 - 1. Anchors to Metal Studs: Barrel and screw system.
 - a. Shaft length: Sized to meet project conditions.
 - b. Screw length: Sized to meet project conditions.
 - 2. Ties: Provide minimum 2 inches (50mm) embedment in mortar.
 - a. Wire: 3/16 inch diameter by length required for project conditions.
 - b. Material: Hot-dipped galvanized.

2.05 FLASHINGS

- A. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch (1.0 mm) thick.

2.06 ACCESSORIES

- A. Backer Rod: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; maximum lengths available.
- B. Joint Filler: Closed cell expanded rubber; oversized 50 percent to joint width; self expanding; maximum lengths available.
 - 1. Performance Characteristics:
 - a. Density: 3.5 - 5.0 p.c.f. per ASTM D 1667.
 - b. Compression deflection 25%: 1.5 - 3.0 psi per ASTM D 1056.
 - c. Tensile strength: 40 psi per ASTM D 412.
 - d. Elongation: 100% per ASTM D 412.
 - e. Water absorption: 5% maximum per ASTM D 1056.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
- D. Weeps:
 - 1. Type: Molded PVC grilles, insect resistant and polyethylene tubing.
 - 2. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 2-2/3 sq ft (0.25 sq m) of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 2-2/3 sq ft (0.25 sq m) of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.10 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at nonmasonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:

1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Lap end joints of flashings at least 6 inches (152 mm), minimum, and seal watertight with flashing sealant/adhesive.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 4 inch (101 mm) bearing on each side of opening.

3.12 GROUTED COMPONENTS

- A. Lap splices minimum 48 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.13 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.15 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.17 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.18 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

This page intentionally left blank

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

- B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation.

- C. Related Requirements:

1. Section 072100 "Thermal Insulation" for cavity wall insulation.
2. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

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

1.4 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. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Clay face brick, in the form of straps of five or more bricks.
2. Colored mortar.
3. Weep holes/cavity vents.

1.5 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. Include data on material properties and, if required by authorities having jurisdiction, material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
 - e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
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.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high by full thickness.
 2. Build sample panels facing south.
 3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
 4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups for typical exterior wall in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include studs, sheathing, water-resistive barrier, sheathing joint-and-penetration treatment, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 3. Protect accepted mockups from the elements with weather-resistant membrane.

4. Approval of mockups 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.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 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.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover 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:
 - 1. Do not use frozen materials or materials mixed or coated with ice or frost.
 - 2. Do not build on frozen substrates.
 - 3. Do not lay masonry units that are wet or frozen.
 - 4. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - 5. Remove and replace unit masonry damaged by frost or by freezing conditions.
 - 6. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 7. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

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 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 C1314.
- B. Detailing of masonry reinforcement and grout shall be in accordance with “Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-2).”
- C. Masonry material, quality assurance and field execution for reinforced and grouted masonry construction shall be in accordance with “Specifications for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02).”
- D. Masonry Grout Testing: Three (3) grout test samples shall be taken every day of masonry construction for the first three days of masonry construction with an additional three (3) samples taken for every 30 cubic yards placed, once per week, or every 5000 square feet of wall constructed, whichever is most stringent sampling. Specimens shall be sampled and prepared in accordance with ASTM C1019 and compression testing shall be conducted in accordance with ASTM C39.
- E. Testing and Inspection: Special inspector, which is an independent testing laboratory selected and paid for by the Owner (or by the Contractor as assigned by the Owner and acceptable to the Architect), shall ensure that materials, construction and workmanship are in compliance with the plans and specifications. Coordinate erection and testing to facilitate construction. Testing agency shall be qualified according to ASTM C 1093-95 (2001).
- F. Compressive Strength Verification by the Unit Strength Method:
 1. Unless noted otherwise, compressive strength of masonry shall be determined by the unit strength method.
 2. For Level 1 Quality Assurance, provide one verification of f'_m at the start of masonry construction.
 3. For Level 2 Quality Assurance, provide one verification of f'_m at the start of masonry construction and every 5,000 square feet during construction.
- G. Prism Testing: Prism Testing required only where specifically noted on project documents.
 1. Prism tests: Masonry compressive strengths shall be verified by prism tests in accordance with ASTM C 1314-03b.
 - a. Prisms shall be built by the Contractor and tested by an independent testing agency selected and paid by the Contractor and acceptable to the Architect.
 - b. Prisms shall be built by utilizing materials being placed in the building, by the masons constructing the bearing walls.
 - c. Masons for building the units for prism testing shall be selected at random, and at least two (2) masons shall be selected to construct the prisms for any one test.
 - d. Prisms shall be built on pallets as required for handling and storage.
 2. Test requirements: Each test shall consist of three prisms. One test shall be required for each 5,000 square feet of masonry work. Where, in any one-story height, both grouted and ungrouted walls occur, one set of “A” prisms and one set of “B” prisms shall be constructed.

- a. Correction factors for pier sizes from the NCMA code shall be applied to the failure stress and the minimum acceptable corrected ultimate strength shall be 1500 psi.
- b. Should any prisms fail to meet the minimum strength or prove to have been improperly prepared, additional testing and all corrective measures shall be at the expense of the Contractor.

2.3 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 vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 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. CMUs: ASTM C90.
 1. Unit Compressive Strength: Provide ASTM C 90-99, 2,650 psi min. compressive strength on net block area ($f_m = 2000$ psi).
 2. Density Classification: Lightweight unless otherwise indicated on the Structural Drawings.
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Special Shapes: Provide where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 5. Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated.
 6. Provide cleanouts at base of each grout pour height that exceeds 5'-0".
 7. Low-lift grouting is the only approved method. If high-lift grouting is desired then specific approval and detailing requirements from the EOR will be required.

2.5 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:

- B. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs. Comply with requirements indicated on the Structural Drawings.
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216.
 - 1. Brick Type:
 - a. Product: As selected by the Architect from the manufacturer's full range.
 - b. Color: As selected by the Architect from the manufacturer's full range.
 - c. Style: As selected by the Architect from the manufacturer's full range.
 - d. Size: As selected by the Architect from the manufacturer's full range.
 - 2. Grade: SW.
 - 3. Type: FBX or FBS.
 - 4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi unless otherwise indicated on the Structural Drawings.
 - 5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
 - 6. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
 - 7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.

2.7 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 2. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 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.
- G. Aggregate for Grout: ASTM C404.
- H. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- 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 steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.

3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer 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 A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire.

- E. 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. 0.064-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.
 - 3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
 - a. 0.064-inch- thick galvanized sheet may be used at interior walls unless otherwise indicated.
- F. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches 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.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.
- H. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
 - 3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 - 4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
 - 5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - 6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed washer head that covers hole in sheathing.
 - 7. Seismic Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section. Wire tie has sheet metal clip welded to it with integral tabs designed to engage continuous wire.

8. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
7. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
8. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
9. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Copper Sealtite 2000.
 - 2) Hohmann & Barnard, Inc; Copper Fabric Flashing NA or Copper Fabric Flashing SA.
 - 3) STS Coatings, Inc.
 - 4) Wire-Bond; Copper Seal Flashing #4140.
 - 5) York Manufacturing, Inc; Multi-Flash 500.
2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymers alloy.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc; Flex-Flash.

- 2) Hyload, Inc.; Hyload Cloaked Flashing System.
 - 3) Mortar Net Solutions; Total Flash.
 - 4) Wire-Bond; Rhino Bond Flashing #4123.
- b. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - c. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of adhesive.
 - d. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch 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 from edge.
 - 1) Color: As selected by the Architect from the manufacturer's full range.
 - e. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. 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.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
- E. 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.
- F. Termination Bars for Flexible Flashing: Stainless steel bars 0.075 inch by 1 inch or stainless steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, 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 D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:
 - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Mortar Maze Cell Vent.
 - 2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
 - 3) Hohmann & Barnard, Inc; QV Quadro-Vent.
 - 4) Mortar Net Solutions.
 - 5) Wire-Bond; Cell Vent (#3601).
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break or Mortar Break II.
 - b. Hohmann & Barnard, Inc; Mortar Trap.
 - c. Keene Building Products.
 - d. Mortar Net Solutions; Mortar Net with Insect Barrier or Wall Defender.
 - e. Wire-Bond; Cavity Net DT.
 - f. York Manufacturing, Inc; Weep-Net.
 - 2. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity, with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.12 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 portland cement-lime mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar.

- 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 C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S or Type N.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- F. Grout for Unit Masonry: Comply with ASTM C476.
 - 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 C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. 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.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

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 bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by 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 under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge nonload-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.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and 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.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- E. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, or air barriers unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not more than 8 inches clear horizontally and 16 inches clear vertically.
 4. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- E. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections, connector sections, and continuous wire in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.
- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of sheathing and insulation, unless otherwise indicated on the Drawings.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

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

3.9 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 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 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.
- C. Form expansion joints in brick as follows:
 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 3. Build in compressible joint fillers where indicated.
 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

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

3.12 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and 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 multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
 - 3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier or air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
 - 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 - 6. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 - 7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
 - 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
- E. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.
- F. Place cavity drainage material in cavities or airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

- G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY

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

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.15 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. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 4. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is indicated on the Civil Drawings.
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. 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 042000

This page intentionally left blank

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Prefabricated building columns.
3. Shear stud connectors, shop and field welded.
4. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
3. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.
- B. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical" on Drawings.

1.3 COORDINATION

- A. 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.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Prefabricated building columns.
9. Shop primer.
10. Galvanized-steel primer.
11. Etching cleaner.
12. Galvanized repair paint.
13. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify demand-critical welds.
6. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

D. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- ### A. Qualification Data: For Installer, fabricator, shop-painting applicators, professional engineer, testing agency.
- ### B. Welding certificates.
- ### C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Shop-Painting Applicators: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
- B. Connection Design Information:
 - 1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use Allowable Stress Design; data are given at service-load level.
- C. Moment Connections: Fully restrained.
- D. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992, **Grade 50**.
- B. Channels, Angles, M-Shapes, S-Shapes: ASTM A36.
- C. Plate and Bar: **ASTM A572, Grade 50**.
- D. Steel Pipe: ASTM A53, Type E or Type S, Grade B.
 - 1. Weight Class: As indicated..
 - 2. Finish: As indicated.
- E. Steel Castings: ASTM A216, Grade WCB, with supplementary requirement S11.
- F. Steel Forgings: ASTM A668.
- G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, **Grade A325**, Type 1, heavy-hex steel structural bolts; **ASTM A563, Grade D**, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125, **Grade A490**, Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; **ASTM A563, Grade D**, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

- C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36, ASTM F1554, Grade 55, 105 (where indicated) and weldable where indicated.
 - 1. Configuration: As indicated..
 - 2. Nuts: **ASTM A563** heavy hex carbon steel.
 - 3. Plate Washers: ASTM A36 carbon steel.
 - 4. Washers: **ASTM F436**, Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- B. Headed Anchor Rods: ASTM F1554, Grade 36, ASTM F1554, Grade 55, 105 (where indicated), straight.
 - 1. Nuts: **ASTM A563** heavy hex carbon steel.
 - 2. Plate Washers: ASTM A36/A36M carbon steel.
 - 3. Washers: **ASTM F436**, Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- C. Threaded Rods: ASTM A36, ASTM F1554, Grade 55, 105 (where indicated.)
 - 1. Nuts: **ASTM A63** heavy-hex carbon steel.
 - 2. Washers: **ASTM F436** Type 1, hardened, ASTM A36 carbon steel.
 - 3. Finish: Plain.

2.5 SLIDE BEARINGS

- A. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
 - 1. Mating Surfaces: PTFE and mirror-finished stainless steel.
 - 2. Coefficient of Friction: Not more than 0.06.
 - 3. Design Load: Not less than **5,000 psi**.
 - 4. Total Movement Capability: As indicated.

2.6 PRIMER

- A. Steel Primer:
 - 1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.7 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.8 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.
- F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces..**Do not thermally cut bolt holes or enlarge holes by burning.**
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.9 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: [**Snug tightened**] [**Pretensioned**] [**Slip critical**].
- B. Weld Connections: Comply with AWS D1.1 **and** AWS **D1.8/D1.8** for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
- C. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize **lintels**, **shelf angles** attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 inches**.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces unless indicated to be painted.
 6. Corrosion-resisting (weathering) steel surfaces.
 7. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 1. SSPC-SP 6 (WAB)/NACE WAB-3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of **1.5 mils**. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- E. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94/E94M.
4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.
 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
1. Joint Type: Snug tightened.
 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
- B. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 1. Bolted Connections: Inspect **and** test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
 3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

SECTION 05 21 00 – STEEL JOIST FRAMING

Part 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Open-web K-series steel joists.
 - 2. LH-series long-span steel joists.
 - 3. Joist girders.
 - 4. Joist accessories.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Division 04 Section "Unit Masonry Assemblies" for installing bearing plates in unit masonry.
 - 3. Division 09 Section "Painting" for prime painting.

1.03 DEFINITIONS

- A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads within limits and under conditions indicated.
- B. Structural Performance: Provide special joists and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Dead Loads: As shown on drawings.
 - 2. Live Loads: As shown on drawings.
 - 3. Wind Loads: As shown on drawings.
 - 4. Earthquake Loads: As shown on drawings.

1.05 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated. (For Architects Record Only)
- B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction. (For Architects Review Only)
 - 1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. (For Architects Record Only)
- C. Welding Certificates: Copies of certificates for welding procedures and personnel. (For Architects Record Only)
- D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements. (For Architects Record Only)
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. (For Architects Record Only)

- F. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction. (For Architects Record Only)

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 - 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.08 SEQUENCING

- A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

Part 2 PRODUCTS

2.01 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for chord and web members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- E. Welding Electrodes: Comply with AWS standards.
- F. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035 ASTM A 780.

2.02 PRIMERS

- A. Primer: SSPC-Paint 15, Type I, red oxide; FS TT-P-636, red oxide; or manufacturer's standard shop primer complying with performance requirements of either of these red-oxide primers.

2.03 OPEN-WEB K-SERIES STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.

1. Joist Type: K-series steel joists.
 - B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
 - C. Provide holes in chord members for connecting and securing other construction to joists.
 - D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
 - E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
 - F. Do not camber joists.
 - G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).
- 2.04 JOIST GIRDERS
- A. Manufacture joist girders according to "Standard Specifications for Joist Girders," in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
 - B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
 - C. Provide holes in chord members for connecting and securing other construction to joist girders.
 - D. Camber joist girders according to SJI's "Specifications."
 - E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).
- 2.05 JOIST GIRDERS
- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
 1. Furnish additional erection bridging if required.
 - B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.
 - C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.
 - D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.
- 2.06 CLEANING AND SHOP PAINTING
- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
 - B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
 - C. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

Part 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Field welds will be visually inspected according to AWS D1.1.
- C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:
 - 1. Radiographic Testing: ASTM E 94 and ASTM E 142.
 - 2. Magnetic Particle Inspection: ASTM E 709.
 - 3. Ultrasonic Testing: ASTM E 164.
 - 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
 - 1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts." or "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.04 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
 - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 - 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

This page intentionally left blank

This page intentionally left blank

SECTION 05 3100

STEEL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes the following:
 - 1. Roof deck.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
 - 2. Division 05 Section "Structural Steel" for shop-welded shear connectors.
 - 3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.03 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated, (For Architect's Record Only).
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction. (For Architect's Review Only)
- C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements. (For Architect's Record Only)
- D. Welding Certificates: Copies of certificates for welding procedures and personnel. (For Architect's Record Only)
- E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products. (For Architect's Record Only)
 - 1. Mechanical Fasteners
- F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction. (For Architect's Record Only)

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck 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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code—Steel”, and AWS D1.3, “Structural Welding Code—Sheet Steel”.
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL’s “Fire Resistance Directory” or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI’s “Specification for the Design of Cold-Formed Steel Structural Members”.
- F. FM Listing: Provide steel roof deck evaluated by FM and listed in FM’s “Approval Guide, Building Materials” for Class 1 fire rating and Class 1-90 windstorm ratings.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Deck:
 - a. Concolidated Systems, Inc.
 - b. Epic Metals Corp.
 - c. Nucor Corp.; Vulcraft Div.
 - d. United Steel Deck, Inc.

2.02 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with “SDI Specifications and Commentary for Steel Roof Deck”, in SDI Publication No. 29, and the following:
 - 1. Galvanized-Steel Sheet: ASTM A653, Structural Steel Grade 50, G90 zinc coating.
 - 2. Deck Profile: As shown on drawings.
 - 3. Profile Depth: As shown on drawings.
 - 4. Design Uncoated-Steel Thickness: As shown on drawings.
 - 5. Span Condition: Triple span or more.
 - 6. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653, Structural Steel Grade 40, G90 zinc coating.
 - 2. Deck Profile: As shown on drawings.
 - 3. Profile Depth: As shown on drawings.
 - 4. Design Uncoated-Steel Thickness: As shown on drawings.
 - 5. Side Laps: Overlapped.

2.04 ACCESSORIES

- A. General: Provide manufacturer’s standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8mm) minimum diameter.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Repair Paint: Lead-and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1 ½ inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch , nominal.
 - 2. Weld Spacing: As shown on drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of ½ of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws with spacing as shown on the drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1 1/12 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.04 FLOOR DECK INSTALLATION

- A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1 ½ inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: As shown on drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of ½ of the span or 18 inches (450 mm), and as follows:
 - 2. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws with spacing as shown on the drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1 1/12 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches, minimum.
- D. Pour stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
 - 1. Wire brush and clean rust spots, welds, and abraded areas on [both surfaces] [top surface] of prime-painted deck immediately after installation, and apply repair paint.
 - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.06 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
- B. Field welds will be subject to inspection.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.07 REPAIRS AND PROTECTION

- A. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following Cold-formed metal framing for:
 - 1. Interior and Exterior Non-Load-Bearing Steel Stud Walls.
 - 2. Bridging, bracing, clips and other accessories.
 - 3. Resilient Channels.
 - 4. Aluminum Burn Clips

1.2 SUSTAINABLE DESIGN PROJECT REQUIREMENTS

- A. See Specification Section 013510 Sustainable Design Requirements for project requirements applicable to this Section.

1.3 REFERENCES

- A. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- B. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runner Tracks, and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- F. AISI – Code of Standard Practice.
- G. AISI – Standard for Cold-Formed Steel Framing General Provisions.
- H. AISI - North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members - 2001.
- I. American Welding Society (AWS).
- J. AWS D1.1 "Structural Welding Code - Steel."

- K. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads:
 - a. As indicated on structural drawings.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 at typical framing 1/900 at brick/stone veneer of the wall height.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 at typical framing of the wall height under a horizontal load of 5 lbf/sq. ft.
 - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 at typical framing 1/600 at brick/stone veneer.
 3. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.

1.5 SUBMITTALS

- A. Submit manufacturer's product literature and data sheets for specified products and their accessories.
- B. Manufacturer's certification of product compliance with codes and standards.
- C. Shop Drawings: Submit shop drawings prepared by manufacturer for approval showing:
1. Locations of framing members, wall framing sections and opening elevations.
 2. Sizes and spacing of framing members.
 3. Methods of fastening framing members to each other.
 4. Locations and spacing of lateral bracing, structural bracing systems and their anchorage.
 5. Accessory products required for complete installation.
 6. Shop Drawings shall be signed and sealed by a registered PE (Professional cold-formed specialty Engineer) registered in the state of North Carolina.
- D. Structural Calculations: Submit structural calculations prepared by manufacturer's engineer for approval.
1. Submittal shall be signed and sealed by a registered PE (Professional cold-formed specialty Engineer) registered in the state of Virginia.
 2. Description of design criteria.
 3. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
 4. Selection of framing components, accessories, fasteners and welded connection requirements.
 5. Engineer shall have a minimum of 10 years of experience with projects of similar scope.

- E. Welding certificates.
- F. Qualification data.
- G. Product test reports.
- H. Research/evaluation reports.

1.6 QUALITY ASSURANCE

- A. Panelizer shall provide effective, full time quality control over all fabrication and comply with the pertinent codes and regulations of government agencies having jurisdiction.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
- C. Welding: Qualify procedures and personnel complying with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 - 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- F. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- G. Conduct a pre-installation meeting at the job site to verify project requirements, substrate conditions, and to review manufacturer's installation requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Notify structural engineer and manufacturer of damaged materials received prior to installing.
- B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA).

2.2 MATERIALS

- 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 25 percent.
- B. Steel Sheet: ASTM A 1003 Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance
 - 2. Coating: G60 minimum complying with ASTM C 955.
 - 3. Tensile Strength: 33 ksi or 50 ksi as require by manufacturer.
- C. Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

2.3 RESILIENT CHANNELS

- A. Resilient Channels: Provide RC Deluxe Resilient Channels by Clark Dietrich at locations indicated on the drawings. See the Architectural Drawings for floor/ceiling and wall assembly details.
- B. Resilient Channels: Provide RC-1 Pro Resilient Channels (RCUR) by Clark Dietrich at locations indicated on the drawings. See the Architectural Drawings for floor/ceiling and wall assembly details.

2.4 ALUMINUM BURN CLIPS

- A. Aluminum Burn Clips: Provide Aluminum Burn Clip (AB) by Clark Dietrich at area separation wall locations indicated on the drawings. See the Architectural Drawings for locations.

2.5 NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 18 gage minimum.
 - 2. Flange Width: 1-3/8 inches

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- F. Slotted Deflection Tracks: Manufacturer's slotted, U-shaped steel tracks with pre-punched slots for connections to allow for vertical deflection.
- G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.
- B. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- C. Anchor Bolts: ASTM F 1554, Grade 36 threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by the hot-dip process according to ASTM A 153/A 153M, Class C.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.7 MISCELLANEOUS MATERIALS

- A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect supporting substrates and structures for compliance of proper conditions for installation and performance of the Pre-Panelized Load-Bearing Steel Stud Wall framing.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the Pre-Panelized Load-Bearing Steel Stud Wall framing.
- C. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 FABRICATION

- A. Prior to fabrication of framing, wall panel manufacturer shall submit shop drawings and calculations to the Architect / Engineer to obtain approval.
- B. All framing components shall be cut square with a tolerance of plus 0" and minus 0.125" in length.
- C. Splices in members other than top and bottom runner track are not permitted.

3.4 INSTALLATION, GENERAL

- A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. INSTALLATION - NON-BEARING EXTERIOR WALLS AND INFILL FRAMING

1. Runners shall be securely anchored to the supporting structure as shown on the drawings.
2. Jack studs or cripples shall be installed below window sills, above window and door heads, and elsewhere to furnish supports.
3. Lateral bracing shall be provided by use of gypsum board and gypsum sheathing or by horizontal straps or cold-rolled channels. Bracing shall conform to Section D3 of the AISI North American Specification (NAS).
4. Provisions for structure deflection/vertical movement shall be provided. A slip track or some means of allowing the structure to deflect must be accounted for in non-axial bearing walls.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

I. Stud spacing shall be as indicated on the drawings.

3.5 FIELD QUALITY CONTROL

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

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

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

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

END OF SECTION 05 40 00

**SECTION 05 50 00
METAL FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel items.
- B. Steel framing and supports for mechanical and electrical equipment.
- C. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- D. Metal bollards.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.
- M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- P. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.04 QUALITY ASSURANCE

- A. Design supports under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS**2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- B. Lintels: As detailed; prime paint finish.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be imbedded in masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

This page intentionally left blank

**SECTION 05 51 00
METAL STAIRS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 REFERENCE STANDARDS

- A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2019.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- K. 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; 2024.
- L. 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; 2018a.
- M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- O. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- Q. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.
- R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- T. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- E. Designer's Qualification Statement.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
 - 2. A company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

PART 2 PRODUCTS**2.01 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
 - 1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
 - 4. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
 - 5. Concrete Reinforcement: Welded wire mesh.
 - 6. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
 - 1. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.
 - 2. Nosing Depth: Not more than 1 inch (25 mm) overhang.
 - 3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.
- E. Stringers: Tube steel.
 - 1. Stringer Depth: 12 inches (305 mm).
 - 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Similar construction, using corrugated steel decking, supported and reinforced as required to achieve design load capacity.
- G. Railings: Steel pipe railings.
- H. Finish: Shop- or factory-prime painted.
- I. Under Side of Stair/Landing: Finished with gypsum board painted as delineated in the plans.

2.03 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
- B. Guards:
 - 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
 - 2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
 - a. Outside Diameter: 1 inch (25 mm).
 - b. Material: Steel pipe or tube, round.
 - c. Vertical Spacing: Maximum 4 inches (100 mm) on center.
 - d. Jointing: Welded and ground smooth and flush.
 - 3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

- E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.
- G. Concrete Fill: Portland cement Type I, 3000 psi (20 MPa) 28 day strength, 2 to 3 inch (51 to 76 mm) slump.
- H. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.05 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 - 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 - 2. Number of Coats: One.
- D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
 - 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

This page intentionally left blank

**SECTION 05 51 33
METAL LADDERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop-fabricated metal ladders.

1.02 REFERENCE STANDARDS

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2018.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- H. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- C. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.04 QUALITY ASSURANCE

- A. Design ladder under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS**2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Bolts, Nuts, and Washers: ASTM A307, plain.
- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.

- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED LADDERS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 - 1. Side Rails: 3/8 by 2 inches (9 by 50 mm) members spaced at 20 inches (500 mm).
 - 2. Rungs: One inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
 - 3. Space rungs 7 inches (175 mm) minimum from wall surface.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Do not prime surfaces where field welding is required.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on shop drawings.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed .

END OF SECTION

**SECTION 05 52 13
PIPE AND TUBE RAILINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Free-standing railings.

1.02 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- C. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- E. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Fabricator Qualifications:
 - 1. A company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

PART 2 PRODUCTS**2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
 - 1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
 - 2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
 - 3. Posts: 1-1/2 inches (38 mm) diameter, round.

- F. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 STEEL FINISHES

- A. Shop primed and field painted.
 - 1. Color: As selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

**SECTION 06 10 00
ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Subflooring.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.
- F. PS 1 - Structural Plywood; 2023.
- G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- H. PS 20 - American Softwood Lumber Standard; 2020.
- I. SPIB (GR) - Grading Rules; 2014.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for

the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Subflooring: PS 2 type, rated Sheathing - fire retardant treated.
1. Bond Classification: Exterior.
 2. Span Rating: 48.
 3. Performance Category: 3/4 PERF CAT.
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Fire Retardant Treatment:
1. Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

- b. Treat lumber in contact with masonry or concrete.
- 2. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- D. Specifically, provide blocking and framing for the proper installation of the following:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Televisions.
- E. Provide wood ground along base of wall at floor, 1 1/2 inches tall by thickness of wallboard, continuous behind all rubber base.
 - 1. Finish face of ground shall be flush with finish face of wallboard.
 - 2. Set wallboard tight to top of ground.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring: Screw to framing; staples are not permitted.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

3.05 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061000 – ROUGH CARPENTRY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Related work specified elsewhere:

1. Concrete formwork.
2. Finish carpentry and millwork.
3. Gypsum wallboard systems.
4. Painting.

1.2 SUBMITTALS

- A. Preservative treated wood certification: Submit for Architect's information only. Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards.
- B. Fire-retardant treatment: Submit physical properties of lumber after treatment. Provide all lumber reference value reduction factors with an approved ICC report.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Immediately upon delivery to job site, place materials in areas protected from weather.
- B. Store materials a minimum of 6" above ground on blocking and cover with protected waterproof covering, providing for adequate air circulation and ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect sheet materials from breaking corners and damaging surfaces.

1.4 QUALITY CRITERIA

- A. Applicable Standards: Grading rules and standards of the following associations apply to materials furnished under this section:
1. Southern Pine Inspection Bureau (SPIB).
 2. National Forest Products Association (NFPA).
 3. West Coast Lumber Inspection Bureau (WCLB).
 4. Western Wood Products Association (WWPA).
 5. American Society for Testing and Materials (ASTM) as referenced.

- B. Plywood Grading Rules: Softwood plywood, Construction and Industrial; Product Standard PS-1-74.
- C. Grade Marks: Identify all lumber and plywood by official grade marks.
 - 1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable, and condition of seasoning at time of manufacture.
 - 2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association indicating:
 - a. Type, grade, class and identification index.
 - b. Inspection and testing agency mark.
- D. Preservative Treated Material: Meeting specified standards of the American Wood Preservers Association (AWPA) and American Wood Preservers Institute (AWPI) as indicated.

PART 2 – PRODUCTS

2.1 LUMBER

- A. Dimensions: Indicated lumber dimensions are nominal. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and all the rules writing agencies.
- B. Moisture Content: 19% maximum at time of permanent closing in of building or structure, except as otherwise noted.
- C. Surfacing: Surface four sides (S4S).
- D. Framing Lumber:
 - 1. Main framing:
 - a. Beams and headers: #2 Southern Pine
 - 2. Light framing:
 - a. General framing: #2 Spruce-Pine-Fir.
 - b. Plates, blocking, bracing, and nailers: #3 Spruce-Pine-Fir. Lumber in contact with concrete slabs, exterior masonry walls, or in conjunction with gravel stops or roofing shall be preservative treated in accord with AWPA C1-77 and AWPI LP-22, CCA, Type A, non-leaching type preservative.
 - c. General utility purposes: Utility Grade or #3 Spruce-Pine-Fir.
 - 3. Studs:
 - a. Loadbearing and Exterior: #2 Spruce-Pine-Fir.
 - b. Non-loadbearing: Stud grade Spruce-Pine-Fir.

4. Structural joists: #2 Southern Pine
5. Planks: 2” to 4” thickness, 6” and wider: #2 Spruce-Pine-Fir or Western Lumber, except where spans exceed allowable as defined by National Forest Products Association, “Span Tables for Joist and Rafters”, shall be as required by span. Maximum moisture content: 19%.
6. Plates:
 - a. Wall Top and Bottom Plates: #3 Southern Pine

2.2 SHEET MATERIAL

- A. Plywood:
 1. Miscellaneous: APA Rated sheathing, EXP-1, Group I, tongue and groove edges, thickness indicated.

2.3 PRESERVATIVE TREATED MATERIALS

- A. Standards:
 1. Lumber: Meeting AWPA C-1-77
 2. Sheet: Meeting AWPA C-9-77.

2.4 FIRE-RETARDENT TREATED MATERIALS

- A. General: Where fire-retardent materials are indicated, use materials complying with the requirements below and with fire-test response characteristics specified as determined by testing identical products by a qualified testing agency.
- B. Fire-retardent treated lumber and plywood products shall have a flame spread index of 25 or less when tested in accordance with ASTM E 84, and with no evidence of significant progressive combustion when the test is extended for an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant treated wood with appropriate classification marking of qualified testing agency.
- E. All lumber in exterior walls shall be treated with an approved fire-retardent treatment. Reference the UL assemblies and wall types in the architectural drawings for other locations where fire-retardant treated lumber is required.
- F. All engineered lumber that is located within or penetrates the exterior Type IIIA wall assemblies shall be fire treated to meet the requirements of Section 2303.2 of the Florida Building Code.

1. In accordance with the 'Other Means of Manufacture' clause of the Florida Building Code, section 2303.2.2, a fire inhibitor coating must be factory applied to all engineered lumber by a wood coating plant with an approved quality auditing program.

- a. Acceptable fire inhibitor coating products:

- 1) Eco Red Shield, Eco Building Products

2.5 HARDWARE

- A. Provide nails, bolts, nuts, washers, screws, expansion bolts, clips, powder actuated fasteners and similar hardware necessary for complete installation of rough carpentry items. Provide G90 hot-dipped galvanized steel or Type 304 stainless steel for components for all non-pressure treated and fire-retardant treated lumber except nails shall be hot-dipped galvanized. Material and finish for use with pressure preservative treated components shall be G185 hot-dipped galvanized steel or Type 316L stainless steel.

PART 3 – EXECUTION

3.1 WORKMANSHIP

- A. Install wood framing and carpentry work cut square on bearings, closely fitted, accurately set to required lines and levels, and secured in place.
- B. Lay out the work to provide correct openings to receive work of other trades.
- C. Brush apply preservative treatment to cut ends of treated lumber. Materials shall be of same types as used for original treatment.

3.2 STUD FRAMING

- A. Plates and stud members:
 1. Provide single bottom plate and double top plates for partitions.
 2. Provide studs in continuous lengths without splices.
 3. Toenail studs to bottom plate and end-nail to lower top plate. Provide Hurricane straps at as shown on drawing.
 4. Overlap double top plate minimum of 6" at corners and intersections.
 5. Face nail upper top plate to lower top plate and provide hurricane straps as shown on drawing.
 6. Nail bottom plate to wood construction and provide hurricane straps as shown on drawing.
 7. Nail bottom plate to wood construction and provide hurricane straps as shown on drawing.
 8. Triple studs at corners and partition intersection.
 9. For partition parallel with joist: Locate joist directly below studs.
 10. Framing openings:

- a. Double studs and headers: Opening less than 4'-0", unless noted otherwise on drawings.
- b. Triple studs and headers: Openings 4'-0" and greater, unless noted otherwise on drawings.

11. Space studs at 1'-4" o.c. maximum, unless noted otherwise on drawings.

B. Headers:

1. Provide continuous headers, same width as studs, depth required to span opening.
2. Toenail headers to studs and opening framing.
3. Lap headers at intersection with bearing partitions or tie with metal straps.

C. Blocking:

1. Install in continuous horizontal row in middle 1/3 of stud height and at all horizontal plywood joints.
2. Wedge, align and anchor blocking with nails.
3. Coordinate blocking with locations of finishing materials, fixtures, specialty items and trim.

3.3 JOIST FRAMING

A. Install with crown edge up.

B. Support ends of each member minimum of 1-1/2" of bearing on wood or steel.

C. Lap members framing from opening sides of beams, girders or partitions minimum 4" or tie opposing members together by toe-nailing or metal connectors.

D. Notches:

1. Do not notch in middle third of joist.
2. Notches in top or bottom of joist: maximum of 1/6 depth of member.
3. Notched ends: Maximum 1/3 depth of member.

E. Bored Nails: Maximum 1/3 depth of member, 2" minimum distance to top or bottom of joist.

F. Solid Bridging:

1. Size: 2" by depth of joist by length required.
2. Offset bridging to permit end-nailing.
3. Provide one row of blocking for spans up to 10'-0"; two rows for spans over 10'-0".

3.4 RAFTER FRAMING

A. Cut rafters to set on exterior wall plates. Shim and toenail to plate.

- B. At ridge, place rafters directly opposite each other and nail to ridge member. Provide bridging at third points.

3.5 SHEET MATERIAL INSTALLATION

- A. Plywood roof deck and subfloor: Install with face grain perpendicular to supports. Terminate panels over supports. Stagger end joints of adjacent panels.
 - 1. Allow 1/8" between end joints and 1/4" between edge joints for expansion and contraction.
 - 2. Attach plywood as shown on drawings.
 - 3. Provide sheathing clips at midspan of roof sheathing.

END OF SECTION 061000

**SECTION 06 10 01
ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Subflooring.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.
- F. PS 1 - Structural Plywood; 2023.
- G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- H. PS 20 - American Softwood Lumber Standard; 2020.
- I. SPIB (GR) - Grading Rules; 2014.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for

the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Subflooring: PS 2 type, rated Sheathing - fire retardant treated.
1. Bond Classification: Exterior.
 2. Span Rating: 48.
 3. Performance Category: 3/4 PERF CAT.
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Fire Retardant Treatment:
1. Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

- b. Treat lumber in contact with masonry or concrete.
- 2. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- D. Specifically, provide blocking and framing for the proper installation of the following:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Televisions.
- E. Provide wood ground along base of wall at floor, 1 1/2 inches tall by thickness of wallboard, continuous behind all rubber base.
 - 1. Finish face of ground shall be flush with finish face of wallboard.
 - 2. Set wallboard tight to top of ground.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring: Screw to framing; staples are not permitted.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

3.05 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061600 – SHEATHING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Roof sheathing.
3. Composite nail base insulated roof sheathing.
4. Subflooring.
5. Underlayment.
6. Sheathing joint-and-penetration treatment.
7. Flexible flashing at openings in sheathing.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED requirements.
2. Division 06 Section "Rough Carpentry" for plywood backing panels.
3. Division 06 Section "Gypsum Sheathing" for gypsum sheathing.
4. Division 07 Section "Air Barriers" for building wrap air and water barriers.

1.2 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 plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
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.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated plywood.

2. Fire-retardant-treated plywood.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1, Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- B. Oriented Strand Board: DOC PS 2.
- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPAC9.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Comply with performance requirements in AWWA C27.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
 - 4. Use Interior Type A, unless otherwise indicated.
- B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Treat plywood indicated on Drawings.

2.4 WALL SHEATHING

- A. Plywood or Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: Not less than 32/16 or as indicated on drawings.
 - 2. Nominal Thickness: Not less than 15/32 inch (8.7 mm) or as indicated on drawing.

2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: Not less than 48/24 or as indicated on drawings.
 - 2. Nominal Thickness: Not less than 23/32 inch (11.9 mm) or as indicated on drawings.
- B. Oriented-Strand-Board Roof Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: Not less than 32/16 or as indicated on drawings.
 - 2. Nominal Thickness: Not less than 23/32 inch (11.9 mm) or as indicated on drawings.

2.6 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, C-C Plugged, Exterior, C-C Plugged, Exposure 1, Underlayment, Exposure 1, Underlayment single-floor panels.
 - 1. Span Rating: Not less than 24 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).

3. Edge Detail: Square.
4. Edge Detail: Tongue and groove.
5. Surface Finish: Resin-impregnated overlay face.

B. Oriented-Strand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.

1. Span Rating: Not less than 24 o.c.
2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).
3. Edge Detail: Square.
4. Edge Detail: Tongue and groove.
5. Surface Finish: Resin-impregnated overlay face.

C. Plywood Subflooring: Exposure I I single-floor panels or sheathing.

1. Span Rating: Not less than 24 o.c. or 48/24.
2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).

D. Oriented-Strand-Board Subflooring: Exposure 1 sheathing, single-floor panels or sheathing.

1. Span Rating: Not less than 24 o.c. or 48/24.
2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- F. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-

protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.8 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01, ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Use adhesives that have a VOC content of 70 <Insert limit> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than [0.025 inch (0.6 mm), 0.030 inch (0.8 mm), 0.040 inch (1.0 mm)].
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing, Vycor V40 Weather Barrier Strips.
 - c. MFM Building Products Corp.; Window Wrap.
 - d. Polyguard Products, Inc.; Polyguard 300.
 - e. Protecto Wrap Company; BT-20 XL, PS-45.
 - f. <Insert manufacturer's name; product name or designation.>
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prior to commencing with sheathing installation, the contractor shall have a pre-installation conference to ensure that all submittals have been reviewed and approved. A overall installation procedure will be carefully reviewed by owner architect and contractor at this time.
- B. 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.
- C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, saddle sheathing at openings, unless otherwise indicated.

- D. Securely attach to substrate by fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
 4. Table 2305.2, "Fastening Schedule," in BOCA's "BOCA National Building Code."
 5. Table 2306.1, "Fastening Schedule," in SBCCI's "Standard Building Code."
 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's "International One- and Two-Family Dwelling Code."
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- F. Coordinate both 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.
- G. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- H. 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.
- I. All sheathing joints at stucco locations shall be fastened to 2x blocking, both horizontal and vertical, whether the wall is a shear wall or not, to prevent sheathing from separating at joints due to warping.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
1. Combination Subfloor-Underlayment:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
 2. Subflooring:

- a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
3. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
4. Underlayment:
 - a. Nail or staple to subflooring.
 - b. Space panels 1/32 inch (0.8 mm) apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.

3.3 PARTICLEBOARD UNDERLAYMENT INSTALLATION

- A. Comply with the National Particleboard Association's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
 1. Fastening Method: Glue and nail, Nail, Nail or staple underlayment to subflooring.

3.4 HARDBOARD UNDERLAYMENT INSTALLATION

- A. Comply with AHA's "Application Instructions for Basic Hardboard Products" and with hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.
 1. Fastening Method: Nail, Nail or staple underlayment to subflooring.

3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 1. 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.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.6 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 4. Lap weather-resistant building paper over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.
 6. Provide temporary attachment to assist retention until exterior finishes can be installed.

END OF SECTION 061600

**SECTION 06 20 00
FINISH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Wood casings and moldings.

1.02 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide instructions for attachment hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D. Samples: Submit two samples of wood trim 6 inch (150 mm) long.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect from moisture damage.
- C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white maple; prepare for stain finish.
 - a. Profiles: Size and profiles as indicated on the plans.
 - b. Finger Jointing: Not allowed.
 - 2. Window Sills: Clear white maple; prepare for stain finish.
 - a. Profiles: Size and profiles as indicated on the plans.
 - b. Finger Jointing: Not allowed.

2.02 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

- B. Fasteners: Of size and type to suit application; surface finish in concealed locations and countersunk finish in exposed locations.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

2.04 SITE FINISHING MATERIALS

- A. Stain, Shellac, Varnish, and Finishing Materials: Comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Field Finishing: See Section 09 93 00.

2.05 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 93 00.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

**SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.
- D. Factory finishing.
- E. Preparation for installing utilities.

1.02 REFERENCE STANDARDS

- A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- B. BHMA A156.9 - Cabinet Hardware; 2020.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Single Source Responsibility: Provide and install this work from single fabricator.

1.06 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Cabinets:
1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 3. Finish - Semi-Exposed Surfaces: Decorative laminate
 4. Finish - Concealed Surfaces: Manufacturer's option.
 5. Door and Drawer Front Edge Profiles: Decorative laminate.
 6. Casework Construction Type: Type A - Frameless.
 7. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Premium Grade:
 - 1) Provide vertical run and match for doors, drawer fronts and false fronts within each cabinet unit and for entire project.
 - 2) Provide well-matched doors, drawer fronts and false fronts across multiple cabinet faces in one elevation.
 - 3) Cathedral Grain: Point grain crown up and run in the same direction for entire project.
 8. Adjustable Shelf Loading: 50 psf (24.4 gm/sq cm).
 - a. Deflection: L/144.
 9. Cabinet Style: Flush overlay.
 10. Cabinet Doors and Drawer Fronts: Flush style.
 11. Drawer Side Construction: Fabricator's option per AWI grade specified.
 12. Drawer Construction Technique: Fabricator's option per AWI grade specified.

2.03 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.04 PANEL CORE MATERIALS**2.05 HARDWOOD PLYWOOD PANELS****2.06 THERMALLY FUSED LAMINATE PANELS****2.07 LAMINATE MATERIALS**

- A. Manufacturers:
1. Formica Corporation: www.formica.com/#sle.
 2. Panolam Industries International, Inc: www.panolam.com/#sle.
 3. Wilsonart LLC: www.wilsonart.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as indicated.
1. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, color as selected, finish as selected.
 2. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, color as selected, finish as selected.
- D. Allow for twelve colors as selected by Architect from manufacturer's full range for laminate.

2.08 COUNTERTOPS

- A. Solid Surface Countertops: Specified in Section 06 65 10.

2.09 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.10 HARDWARE

- A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:
 - 1. Hardware Types: As indicated on drawings.
 - 2. Product Grade: Grade 2.
- B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- C. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
 - 1. Materials: Steel plates.
 - 2. Products:
 - a. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Drawer and Door Pulls: "U" shaped wire pull, aluminum with satin finish, 4 inch centers ("U" shaped wire pull, aluminum with satin finish, 100 mm centers).
- E. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
 - 1. Install locks as indicated on plans and where not indicated provide two locks per upper and lower cabinet unit in each cabinet location.
 - a. Locate locks as directed by Architect.
- F. Cabinet Catches and Latches:
 - 1. Type: Magnetic catch.
- G. Drawer Slides:
 - 1. Type: Full extension.
 - 2. Static Load Capacity: As indicated below.
 - a. Standard Drawer Pound Class: 100.
 - b. File Drawer Pound Class: 150.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Accuride International, Inc: www.accuride.com/#sle.
 - b. Grass America Inc: www.grassusa.com/#sle.
 - c. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
 - 1. Manufacturers:
 - a. Blum, Inc: www.blum.com/#sle.
 - b. Grass America Inc: www.grassusa.com/#sle.
 - c. Hardware Resources: www.hardwareresources.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.11 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
- E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
 - 1. Provide sequence matching across each elevation.
- F. Provide cutouts for plumbing fixtures, inserts, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- F. Secure cabinets and counter bases to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

**SECTION 06 65 10
SOLID SURFACE FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Countertops in all rooms.

1.02 REFERENCE STANDARDS

- A. ASTM E 84-10b - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM D 256-10 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- C. ASTM D 638-10 - Standard Test Method for Tensile Properties of Plastics.
- D. ASTM D 696-08 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
- E. ASTM D 2583-07 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- F. ASTM D 790-10 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- G. ASTM D 648-07 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- H. ASTM D 792-08 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- I. ASTM D 2565-99(2008) - Standard Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications.
- J. ASTM G 21-09 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- K. ANSI Z 124.3-2005 - American National Standard for Plastic Lavatories.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each type of product indicated.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
 - 1. Includes full size details, edge details, thermoforming requirements, attachments, etc.
 - 2. Show locations and sizes of furring, blocking, including concealed blocking and reinforcing specified in other sections.
 - 3. Show locations and sizes of cutouts and holes for all items installed in solid surface.
- D. Samples: Submit minimum 6 inch by 6 inch sample in specified color and gloss.
 - 1. Cut sample and seam together for representation of inconspicuous seam.
 - 2. Indicate full range of color and pattern variation.
- E. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- F. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
- G. Installer's Qualification Statement.
- H. Manufacturer's Qualification Statement.
- I. Evaluation Service Reports: Show compliance with specified requirements.
- J. See Section 01 70 00 - Execution and Closeout Requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this project, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver components to site until areas are ready for installation.
- B. Store components indoors per manufacturer's instructions prior to installation.
- C. Handle materials so as to prevent damage. Provide protective coverings to prevent damage or staining following installation for the duration of the project.

1.06 FIELD CONDITIONS

- A. During and after installation maintain temperature and humidity conditions in building spaces at the same levels planned for occupancy.
 - 1. Maintain relative humidity planned for the building and an ambient temperature between 65 and 75 degrees fahrenheit for a minimum of 48 hours prior to installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Final Acceptance.
- C. Provide ten year manufacturer warranty from Date of Final Acceptance.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Corian: www.dupont.com.
 - 1. Basis of Design or approved substitution.
- B. LG Hausys America: www.lghausys.com.
- C. Wilsonart: www.wilsonart.com
- D. Hudson: www.hudsonsolidsurfaces.com
- E. Staron: www.staron.com
- F. Substitutions: See Section 01 60 00-Product Requirements.

2.02 MATERIALS

- A. Solid surface 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 (.25 mm) shall be repairable by sanding and/or polishing.
- B. Thickness: 1/2 inch
- C. Edge treatment: See plans for specific locations where more than one edge treatment is specified.
 - 1. Double Eased - 1/8 inch top edge and 1/8 inch bottom edge.
- D. Backsplash: Applied.
- E. Color: As selected by Architect from manufacturer's price group 1 through 6.
 - 1. Allow for four colors as selected by Architect from manufacturer's full range for solid surface.

2.03 ACCESSORIES

- A. Joint adhesive: Manufacturer's standard one-or two-part adhesive kit to create inconspicuous, nonporous joints.
- B. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone - any type), UL-listed silicone sealant in colors matching components.

2.04 FABRICATION

- A. Shop assembly
 - 1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
 - 2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints and without voids.
 - a. Reinforce with strip of solid polymer material, 2" wide.
 - 3. Provide factory cutouts for plumbing fittings and bath accessories as indicated in the plans and on the shop drawings.
 - 4. Rout and finish component edges with clean, sharp returns.
 - a. Rout cutouts, radii and contours to template.
 - b. Smooth edges.
 - c. Repair or reject defective and inaccurate work.
- B. Finish: Surfaces shall have a uniform finish.
 - 1. Matte: Standard finish for high traffic areas.
 - 2. Satin: Standard finish for darker patterns.
 - 3. Semi-gloss: Higher sheen with greater reflectance for lower traffic areas.
 - 4. Gloss: Maximum sheen and reflectance for light traffic areas or vertical applications.

PART 3 EXECUTION**3.01 SEE SECTION 01 70 00 FOR ADDITIONAL REQUIREMENTS.****3.02 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.

3.03 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
 - 1. Provide product in the largest pieces available.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - a. Exposed joints/seams shall not be allowed.
 - 3. 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.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Anchor securely to base cabinets or other supports.
 - 6. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - 7. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Backsplashes and sidesplashes:
 - 1. Install using manufacturer's standard color-matched silicone sealant.
 - a. Install in accordance with manufacturer's instructions.

3.04 REPAIR

- A. Repair or replace damaged work which cannot be repaired to Architect's satisfaction.

3.05 CLEANING & PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.
- C. Protect surfaces from damage until Date of Final Acceptance. Repair or replace damaged components that cannot be repaired to the architect's satisfaction.

3.06 PROTECTION

- A. Protect installed materials from subsequent construction operations.

END OF SECTION

**SECTION 07 11 13
BITUMINOUS DAMPPROOFING****<<<< UPDATE NOTES****PART 1 GENERAL****2.01 SECTION INCLUDES**

- A. Bituminous dampproofing.

2.02 REFERENCE STANDARDS

- A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).
- B. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

2.03 SUBMITTALS

- A. Product Data: Provide properties of primer, bitumen, and mastics.
- B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

2.04 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS**3.01 MANUFACTURERS**

- A. Karnak Corporation: www.karnakcorp.com/#sle.
- B. Mar-Flex Systems, Inc: www.mar-flex.com/#sle.
- C. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

3.02 BITUMINOUS DAMPPROOFING

- A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Asphalt-Base Emulsion for Metal Protective Coating: ASTM D1187/D1187M, Type I - Continuous water exposure within few days after drying or Type II - Continuous weather exposure after drying.
 - 2. Emulsified Asphalt for Roofing Protective Coating: ASTM D1227/D1227M, Type II, Class 1 - Mineral colloid emulsifying agents with non-asbestos fibers.
 - 3. VOC Content: Not more than permitted by local, State, and federal regulations.
 - 4. Applied Thickness: 1/8 inch (3 mm), minimum, wet film.
 - 5. Products:
 - a. W. R. Meadows, Inc; Sealastic Emulsion Type I (spray-grade): www.wrmeadows.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

PART 3 EXECUTION**4.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

4.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

4.03 APPLICATION

- A. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- C. Apply bitumen per manufacturer's recommendations.
- D. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F (14 degrees C); do not exceed finish blowing temperature for four hours.
- E. Seal items watertight with mastic, that project through dampproofing surface.

END OF SECTION

**SECTION 07 13 00
SHEET WATERPROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sheet Waterproofing:
 - 1. Self-adhered modified bituminous sheet membrane.
- B. Geocomposite drainage system.

1.02 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.
- D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).
- E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008, with Editorial Revision (2015).
- F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- G. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2018.
- H. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 2020.
- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- J. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).
- K. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for membrane.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Specimen Warranty.

1.04 QUALITY ASSURANCE

- A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

- C. Store adhesives at temperatures of 40o F (5o C) and above to facilitate handling.
- D. Store membrane cartons on pallets.
- E. Do not store at temperatures above 90o F (32o C) for extended periods.
- F. Keep away from sparks and flames.
- G. Completely cover when stored outside. Protect from rain.
- H. Protect materials during handling and application to prevent damage or contamination.
- I. Avoid use of products which contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.
- B. Product not intended for uses subject to abuse or permanent exposure to the elements.
- C. Protect rolls from direct sunlight until ready for use
- D. Do not apply membrane when air or surface temperatures are below 40o F (4o C).
- E. Do not apply to frozen concrete.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. W.R. Meadows, Inc.: www.wrmeadows.com.
- B. Carlisle Coatings & Waterproofing Incorporated: www.carlisle-ccw.com.
- C. Grace Construction Products: www.na.graceconstruction.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WATERPROOFING APPLICATIONS

- A. Self-Adhered Modified Bituminous Sheet Membrane:
 - 1. Location: Typical around elevator pits.
 - 2. Cover with drainage panel.

2.03 MEMBRANE MATERIALS

- A. Self-Adhered Modified Bituminous Sheet Membrane:
 - 1. Thickness: 60 mil, 0.060 inch (1.5 mm), minimum.
 - 2. Sheet Width: 36 inches (0.914 m), minimum.
 - 3. Tensile Strength:
 - a. Film: 5,000 psi (34.57 MPa), minimum, measured in accordance with ASTM D882 and at grip-separation rate of 2 inches (50 mm) per minute.
 - b. Membrane: 325 psi (2.24 MPa), minimum, measured in accordance with ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches (50 mm) per minute.
 - 4. Elongation at Break: 300 percent, minimum, measured in accordance with ASTM D412.
 - 5. Water Vapor Permeance: 0.05 perm (2.9 ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
 - 6. Low Temperature Flexibility: Unaffected when tested in accordance with ASTM D1970/D1970M at minus 20 degrees F (minus 11 C), 180 degree bend on 1 inch (25 mm) mandrel.
 - 7. Peel Strength: 7 lb per inch (1226 N/m), minimum, when tested in accordance with ASTM D903.
 - 8. Lap Adhesion Strength: 5 lb per inch (875.6 N/m), minimum, when tested in accordance with ASTM D1876.

9. Puncture Resistance: 50 lb (22.67 kg), minimum, measured in accordance with ASTM E154/E154M.
10. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
11. Hydrostatic Resistance: Resists the weight of 200 ft (61 m) when tested in accordance with ASTM D5385/D5385M.
12. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
13. Products:
 - a. EPRO Services, Inc: www.eproinc.com/#sle.
 - b. Mar-flex Waterproofing & Building Products: www.mar-flex.com/#sle.
 - c. W.R. Meadows, Inc; MEL-ROL: www.wrmeadows.com/#sle.
 - 1) Basis of Design or approved substitution.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Seaming Materials: As recommended by membrane manufacturer.
- B. Membrane Sealant: As recommended by membrane manufacturer.
- C. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
 1. Composition: Dimpled polypropylene core; polypropylene or polyester filter fabric.
 2. Thickness: 1/2 inch (12.7 mm).
 - a. Products:
 - 1) EPRO Services, Inc: www.eproinc.com/#sle.
 - 2) Mar-flex Waterproofing & Building Products: www.mar-flex.com/#sle.
 - 3) W.R. Meadows, Inc; Mel-Drain 7955-B: www.wrmeadows.com/#sle.
 - (a) Basis of Design or approved substitution.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Flexible Flashings: Type recommended by membrane manufacturer.
- E. Termination Bars: Aluminum; compatible with membrane and adhesives.
- F. Surface Conditioner: Compatible with membrane.
- G. Adhesives: As recommended by membrane manufacturer.
- H. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.
- E. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate in accordance with ASTM D5295/D5295M.
 1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.

2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
3. Remove and replace areas of defective concrete; see Section 03 30 00.
4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
5. Test concrete surfaces as described in referenced standards, and verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Roll out membrane, and minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.
- D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
- G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
- H. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

- A. Place drainage panel directly against membrane, butt joints, and position to encourage drainage downward; scribe and cut boards around projections, penetrations, and interruptions.
- B. Adhere protection board and drainage panel to substrate with compatible adhesive.

3.05 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.
- B. Protect membrane on vertical and horizontal applications with immediate application of waterproofing protection course, rolled matrix drainage board.
- C. Backfill immediately using care to avoid damaging waterproofing membrane system.

END OF SECTION

**SECTION 07 21 00
THERMAL INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, and exterior wall behind brick/precast veneer wall finish.
- B. Batt insulation in exterior wall construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.04 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS**2.01 APPLICATIONS**

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.
- C. Insulation Over Metal Stud Framed Walls, Continuous (CI): Extruded polystyrene (XPS) board.
- D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Application: Slab-on Grade/Foundation Wall locations.
 - 2. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 3. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 5. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 - 6. Board Thickness: 3 inch (76 mm).
 - a. Slab edge: 3 inch (76mm).
 - b. CMU (below grade): 2 3/4 inch (70mm) - multiple layer.
 - 7. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.

- B. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
 - 1. Application: Stud/CMU Cavity wall locations.
 - 2. Type and Compressive Resistance: Type X , 15 psi (104 kPa), minimum.
 - 3. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 5. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 - 6. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
 - 7. Board Thickness: 2 inch (50 mm).
 - 8. Board Edges: Shiplap, at long edges.
 - 9. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Thermal Resistance: R-value (RSI-value) of 19 (3.34) or as noted on plans.
 - 5. Facing: Unfaced.
- B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Thermal Resistance: R-value (RSI-value) of 19 (3.34) or as noted on plans.

2.04 ACCESSORIES

- A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install boards horizontally on walls.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

- C. Tape insulation board joints.

3.04 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- D. Place 6 inches (152 mm) wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.05 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.06 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

This page intentionally left blank

SECTION 07 24 00
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Composite wall cladding of rigid insulation and reinforced finish coating, Class PB.
- B. Drainage and water-resistive barriers behind insulation board.

1.02 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- B. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- D. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2025.
- E. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2025.
- F. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity; 2025.
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- H. 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).
- I. ASTM E1677 - Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls; 2023.
- J. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2025.
- K. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- L. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2021.
- M. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2022).
- N. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; 2015, with Editorial Revision (2022).
- O. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2023, with Errata.
- P. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2022.
- Q. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.
- D. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches (300 mm) square, illustrating project colors and textures.

- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.04 QUALITY ASSURANCE

- A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.
- B. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
- C. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.
- D. Installer Qualifications: Company specializing in the type of work specified and with at least three years of documented experience.

1.05 MOCK-UPS

- A. Construct mock-up of typical EIFS application on specified substrate, size as indicated on drawings, and including flashings, joints, and edge conditions.
- B. Locate mock-up at approved location convenient for comparison to finished work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.

1.07 FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F (5 degrees C).
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Sto Corp; StoTherm ci: www.stocorp.com/#sle.

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
 - 3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot (mJ/sq m).
- B. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf (299 Pa) differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.

- C. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- D. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches (100 by 150 mm) in size.
- E. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.
- F. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- G. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- H. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- I. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons (500 liters) of sand.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
 - 1. Texture: As indicated in schedule.
 - 2. Color: As selected by Architect from manufacturer's standard range.
- B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh, Class PB.
- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Lightweight Insulated Brick Veneer: Insulated core encapsulated by factory applied reinforced coatings, applied over EIFS.
 - 1. Brick Type: As indicated on drawings.
 - 1. Brick Color: As indicated on drawings.
 - 1. Adhesives: As approved by insulated brick veneer manufacturer for substrate indicated.
 - 1. Mortar: Provide manufacturer's approved acrylic admixture with Type N mortar cement that complies with ASTM C270.
- E. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578, with natural skin surfaces.
- F. Combination Drainage Layer/Water-Resistive Barrier: Air- and water-resistive sheet complying with ASTM E1677 Type I, dimpled or otherwise profiled to maintain air and drainage space between insulation board and sheathing; minimum water vapor permeance of 20 perms (1149 ng/Pa s sq m); furnished or approved by EIFS manufacturer.

2.04 ACCESSORIES

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- C. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in (6 mm) when tested with a 10 ft (3 m) straightedge.

3.02 PREPARATION

- A. Apply primer to substrate as recommended by EIFS manufacturer for project conditions.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
 - 1. Where different requirements appear in either document, comply with the most stringent.
 - 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.04 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Mechanically attach sheet materials to substrate using fasteners and fastener spacing recommended by EIFS manufacturer.
- B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- C. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- D. Lap flexible flashing or flashing tape at least 2 inches (50 mm) on each side of joint or transition.

3.05 INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- C. On wall surfaces, install boards horizontally. On horizontal surfaces, install boards _____.
- D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch (1.6 mm).
- E. Fill gaps greater than 1/16 inch (1.6 mm) with strips or shims cut from the same insulation material.
- F. Rasp irregularities off surface of installed insulation board.

3.06 INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches (64 mm).
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

END OF SECTION

**SECTION 07 26 00
UNDERSLAB VAPOR RETARDER****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Application of an underslab vapor retarder.

1.02 REFERENCE STANDARDS

- A. ASTM E 1745-09 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- B. ASTM E 154-99 (2005) - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover. .
- C. ASTM E 96-05 - Standard Test Methods for Water Vapor Transmission of Materials.
- D. ASTM E 1643-09 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- E. ASTM F 1249-06 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
- F. ASTM D 1709-09 - Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method.
- G. ASTM D 1434-82(2009) - Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting.
- H. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 15 mils thick.
- I. ACI 302.2R-06 - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures.
- B. Submit manufacturer's product data and application instructions.
- C. Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Stack membrane on smooth ground or wood platform to eliminate warping.
- D. Protect materials during handling and application to prevent damage or contamination.
- E. Ensure membrane is stamped with manufacturer's name, product name and membrane thickness at intervals of no more than 85" (220 cm).

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Do not apply on frozen ground.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Stego Industries LLC: Product - Stego Wrap 15: www.stegoindustries.com.
- B. W.R. Meadows: Product - Perminator 15: www.wrmeadows.com.
- C. Layfield Group: Product - VaporFlex 15: www.layfieldgeosynthetics.com.
- D. Inteplast Group: Product - Barrier-Bac VB-350: www.barrierbac.com.

- E. Reef Industries, Inc.: Product - Griffolyn 15 Mil: www.reefindustries.com.
- F. Raven Industries: Product - Vaporblock VB15: www.ravenefd.com.
- G. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Vapor Retarder membrane: Meet or exceed all requirements of ASTM E1745-09 Class A, B, and C and the following:
 - 1. Maximum Permeance ASTM E96: 0.018 Perms.
 - 2. Water Vapor Transmission Rate ASTM F1249 calibrated to ASTM E96 (water method): 0.0012 grains/ft²/hr.
 - 3. Resistance to Organisms and Substrates in Contact with Soil ASTM E154, Section 13: 0.027 Perms.
 - 4. Tensile Strength ASTM E154, Section 9: 64 LBS. Force/Inch.
 - 5. Puncture Resistance ASTM D1709, Method B: 2,200 Grams minimum.
 - 6. Water Vapor Retarder ASTM E1745: 0.007 perms minimum - Meets or exceeds Class A, B and C.
 - 7. Thickness of Retarder (plastic) ACI 302.1R-96: Not less than 15 mils.

2.03 ACCESSORIES

- A. Seam Tape:
 - 1. High Density Polyethylene Tape with pressure sensitive adhesive.
 - a. Width: 4 inches (101.6 mm) minimum.
- B. Pipe Boots:
 - 1. Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.
- C. Pointing Mastic:
 - 1. Pre-mixed, cold applied, polymeric single component sealing compound.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturers instructions.

3.03 APPLICATION

- A. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-10.
- B. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
- C. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fluid-applied membrane air barriers.

1.02 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- F. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.
- G. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials; 2016.
- H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Warranty Documentation: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original packaging with seals unbroken and properly labeled.
- B. Store materials in their original undamaged packaging within clean, dry, and protected location at a temperature less than 90 degrees F (32 degrees C).

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturer before, during, and after installation.
 - 1. Do not apply air barrier products when air or substrate temperatures are above 100 degrees F (38 degrees C) or below 20 degrees F (minus 6 degrees C).

2. Allow wet substrates to dry prior to applying air barrier products.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fluid-Applied Membrane Air Barrier:
 1. Dow: www.dow.com/#sle.
 2. W.R. Meadows, Inc.: www.wrmeadows.com.
 3. Carlisle Coatings & Waterproofing: www.carlisle.com.
 4. Prosoco: www.prosoco.com.
 5. Grace Construction Products: www.graceconstruction.com.
 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLUID-APPLIED MEMBRANE AIR BARRIER ASSEMBLY

- A. Fluid-Applied Membrane Air Barrier: Single-component, vapor permeable, 100 percent silicone elastomeric air barrier.
 1. Dry Film Thickness (DFT): 15 mils, 0.015 inch (0.381 mm), minimum.
 2. Air Permeance: 0.004 cfm/sq ft (0.02 L/sec sq m) maximum leakage when tested at 1.57 psf (75 Pa) pressure difference in accordance with ASTM E2178.
 3. Vapor Permeance: 10 perms (574 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Desiccant Method at 73.4 degrees F (23 degrees C).
 4. Air Barrier Leakage: Not greater than 0.04 cfm/sq ft (0.2 L/sq m) of surface area at pressure of 1.57 psf (75 Pa) when tested in accordance with ASTM E2357.
 5. Ultraviolet (UV) Exposure: Rated for up to 5,000 hours of exposure in accordance with ASTM G154; not less than 12 months.
 6. Elongation: Greater than 600 percent, when tested in accordance with ASTM D412.
 7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 8. Fire Propagation Characteristics: Provide air barrier coatings and accessory materials that are tested for compliance with NFPA 285 when used within exterior wall assembly.
- B. Primer: Water-based silicone adhesion promoter.
- C. Preformed Transition Strips and Molded Corners: Semi-rigid silicone elastomer extrusion, tear resistant, with tapered edges; applied and adhered with sealant.
 1. Elongation: Greater than 400 percent, when tested in accordance with ASTM D412.
 2. Tensile Strength: Greater than 800 psi (5.5 MPa), when tested in accordance with ASTM D412.
 3. Tear Strength: Greater than 200 psi (16 kN/m), when tested in accordance with ASTM D624.

2.03 ACCESSORIES

- A. Thinners and Cleaners: As recommended by material manufacturer.
- B. Crack Fillers: Provide substrate manufacturer's recommended crack fillers or sealants compatible with air barrier assembly components and adjacent materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept work of this section.
- B. Verify that surfaces are clean, dry, and free of frost, dust, dirt, grease, oil, curing compounds, form release agents, laitance, efflorescence, mildew, excess alkalinity, and other conditions affecting performance of this work.

3.02 PREPARATION

- A. Protect work of other trades against damage from application of air barrier coatings.

- B. Protect adjacent surfaces not designated to receive air barrier coatings; provide protection for pedestrians, vehicles, landscaping, and surrounding areas to prevent contact with coating materials.
- C. Clean substrates to remove contaminants and foreign material by pressure cleaning, wire brushing, grinding or other method recommended by air barrier coatings manufacturer.
- D. Prepare substrates in accordance with air barrier coating manufacturer's written instructions.
- E. Repair deteriorated or damaged substrates, repair masonry joints, and fill cracks, voids, honeycombs, and other defects using materials as recommended by air barrier coating manufacturer, and allow patching materials to fully cure.
 - 1. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
 - 2. Fill cracks larger than 1/16 inch (1.6 mm) wide using applicable joint sealant, and fill cracks larger than 1 inch (25.4 mm) wide using joint sealant and compatible bond breaker where movement is expected.
- F. Primer: Apply primer to substrates where required based upon preinstallation testing and air barrier coating manufacturer's recommendations, using application methods and rate of application recommended by manufacturer; allow primer to fully dry prior to application of air barrier coating.

3.03 APPLICATION

- A. Apply air barrier system materials in accordance with manufacturer's instructions.
- B. Transition Strips and Silicone Sealants: Install with approved sealants in accordance with manufacturer's written instructions.
 - 1. Form sealed joints to windows, wall framing systems, door and louver frames, roofing system perimeters, and at interface with other adjacent materials utilizing compatible components that form air barrier assembly.
- C. Air Barrier Coating: Apply air barrier coating using application methods and rate of application recommended by manufacturer, using nap roller or airless sprayer, in accordance with requirements of authorities having jurisdiction (AHJ).
 - 1. Provide wet application not less than 30 mils, 0.030 inch (0.76 mm) thick, or more as required by substrate conditions, with dry film thickness (DFT) not less than 15 mils, 0.015 inch (0.38 mm) thick.

3.04 CLEANING

- A. During completion of this work, remove overspray and excess material, using materials and methods approved by manufacturer that will not damage adjacent materials.
- B. Clean and repair adjacent surfaces damaged by air barrier coating application.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Allow air barrier coatings to fully cure before exposure to traffic or other construction operations.

END OF SECTION

This page intentionally left blank

**SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Mechanically attached system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Deck sheathing.
- D. Flashings.

1.02 REFERENCE STANDARDS

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2019.
- D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).
- E. NRCA (RM) - The NRCA Roofing Manual; 2025.
- F. NRCA (WM) - The NRCA Waterproofing Manual; 2005.
- G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and walkway pad layout.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.
- C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Exceptions are not Permitted:
 - a. Damage due to roof traffic.
 - b. Damage due to wind speed greater than 56 miles per hour (90 km/h) but less than 90 miles per hour (145 km/h).
- D. The Contractor (Roofing System Installer) shall warrant the materials and workmanship of the roofing system against leakage and defects due to faulty materials, workmanship and contract negligence for a period of two (2) years following acceptance of the project by the Owner.
- E. The Roofing System Manufacturer shall inspect the installation and warrant the materials and workmanship of the roofing system against leakage for a minimum period of twenty (20) years following acceptance of the project by the Owner.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle Roofing Systems, Inc: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC: www.firestonebpco.com/#sle.
 - 3. GAF: www.gaf.com/#sle.
 - 4. GenFlex Roofing Systems, LLC: www.genflex.com/#sle.
 - 5. Johns Manville: www.jm.com/#sle.
 - 6. Mule-Hide Products Co, Inc: www.mulehide.com/#sle.
 - 7. Versico, a division of Carlisle Construction Materials Inc: www.versico.com/#sle.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:
 - 1. Carlisle SynTec: www.carlisle-syntec.com/#sle.
 - 2. GAF: www.gaf.com/#sle.
 - 3. Versico Roofing Systems: www.versico.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, mechanically fastened.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
 - a. Field applied coating may not be used to achieve specified SRI.
 - 2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
 - 3. Insulation Thermal Resistance (R-Value): 5 per inch, minimum; provide insulation of thickness required.
- C. Acceptable Insulation Types - Constant Thickness Application:
 - 1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application:
 - 1. Tapered polyisocyanurate board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 60 mil, 0.060 inch (1.5 mm), minimum.
 - 2. Sheet Width: Factory fabricated into widest possible sheets.
 - 3. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Fasteners: As recommended and approved by membrane manufacturer.
- D. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

- A. Parapet sheathing (roof side): Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 5/8 inch (16 mm) thick.
 - 1. Products:
 - a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.
 - 1) Basis of Design or approved substitution.
 - b. National Gypsum Company: www.nationalgypsum.com/#sle.
 - c. USG Corporation; : www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2, 20 psi (138 kPa), minimum.
 - 2. Board Size: 48 by 96 inches (1,220 by 2,440 mm).
 - 3. Board Thickness: As required to achieve R30.
 - 4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch (13 mm); fabricate of fewest layers possible.

2.06 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; other configurations as detailed.

- C. Sheathing Adhesive: Noncombustible type, for adhering gypsum sheathing to metal deck.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
- F. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- G. Insulation Adhesive: As recommended by insulation manufacturer.
- H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Roofing membrane manufacturer's standard.
 - 2. Size: Manufacturer's standard size.
 - 3. Surface Color: White.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.03 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Attachment of Insulation:
 - 1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inches (152 mm) from joints of preceding layer.
- C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (457 mm).
- G. Do not install more insulation than can be covered with membrane in same day.

3.04 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.

- C. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (76 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- D. Mechanical Attachment: Install membrane and mechanical attachment devices in accordance with manufacturer's instructions.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches (102 mm) onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.05 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.06 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

This page intentionally left blank

**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings and counterflashings and other items indicated.
- B. Sealants for joints within sheet metal fabrications.

1.02 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 B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- E. CDA A4050 - Copper in Architecture - Handbook; current edition.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 12 inch (300 mm) in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS**2.01 SHEET MATERIALS**

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, 0.0239 inch (0.61 mm) thick base metal.
- B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.040 inch (1.0 mm) thick; plain finish shop pre-coated with fluoropolymer coating.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
- C. Copper: ASTM B370, cold rolled 16 oz/sq ft, 24 gauge, 0.0216 inch (0.55 mm) thick; natural finish.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.

- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.03 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

END OF SECTION

SECTION 07 65 23
EPDM THROUGH-WALL FLASHING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. EPDM through-wall flashing and accessory products.
- B. Materials and installation methods for EPDM through-wall flashing assemblies as indicated on drawings.
- C. Through-wall flashing and accessories for installation in cavity wall construction in the following locations:
 - 1. Wall bases.
 - 2. Window sills.
 - 3. Heads of openings.
 - 4. Shelf angles.
 - 5. Above projections.
 - 6. At other discontinuities in the cavity.

1.02 REFERENCE STANDARDS

- A. ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
- B. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
- C. ASTM D 746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- D. ASTM D 624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- E. ASTM D 741 Methods of Measuring Dimensions of Rigid Rods Used in Electrical Insulation
- F. ASTM D 4637 Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane
- G. ASTM D 1149 Standard Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber

1.03 SUBMITTALS

- A. Provide in accordance with Section 01 30 00 - Administrative Requirements.
- B. Shop drawings showing locations of through-wall flashing and details of all typical conditions.
- C. Manufacturer's technical data sheets and material safety data sheets for Product and Accessories.
- D. Manufacturer's installation instructions.
- E. Manufacturer's documentation of volatile organic compounds (VOC) content Product and Accessories.
- F. Certification of compatibility by Manufacturer, listing all materials on the Project with which the Product and Accessories may come into contact.
- G. Samples of through-wall flashing minimum 6 inch by 6 inch size.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be experienced in applying the same or similar materials and shall be specifically approved in writing by Manufacturer.
- B. Single-Source Responsibility: Obtain Product and Accessories from single manufacturer.
- C. Product and Accessories shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).
- D. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed Product unless it has been inspected, tested and approved.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, lot number and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by Manufacturer.
- C. Protect stored materials from direct sunlight.
- D. Avoid spillage. Immediately notify Architect if spillage occurs and start clean up procedures. Clean spills and leave area as it was prior to spill.

1.06 WASTE MANAGEMENT AND DISPOSAL

- A. Place materials defined as hazardous or toxic waste in designated containers.
- B. Ensure emptied containers are stored safely for disposal away from children.

1.07 PROJECT CONDITIONS

- A. Applicator shall have full, safe access to area.
- B. Apply Product and Accessories within temperature ranges indicated in Manufacturer's literature.

1.08 WARRANTIES

- A. Provide the Manufacturer's minimum five year material warranty.

PART 2 PRODUCTS**2.01 MANUFACTURER**

- A. Carlisle Coatings & Waterproofing, Incorporated: www.carlisle-ccw.com.
 - 1. Basis of Design or approved substitution.
- B. Hohmann & Barnard, Inc.: www.h-b.com.
- C. Heckman Building Products, Inc.: www.heckmanbuildingproducts.com.
- D. Wire-bond: www.wirebond.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide a membrane constructed to perform as a through-wall flashing durably integrated with the wall assemblies water resistive barrier and cavity drainage system. The installed through-wall flashing shall perform as a liquid water drainage plane to discharge incidental condensation or water penetration to the exterior through the cavity drainage system.
- B. Provide a water proof EPDM membrane through-wall flashing of minimum 0.040 inch (40 mils) thickness consisting of cured, dimensionally-stable, non-reinforced EPDM with talc removed from surfaces. It shall meet the following requirements:
 - 1. Tensile Strength: Not less than 1,600 psi, ASTM D 412.
 - 2. Tensile Elongation: Not less than 500 percent, ASTM D 412.
 - 3. Brittleness Temperature: Not more than minus 65 degrees F, ASTM D 746.
 - 4. Tear Resistance: Not less than 200 lbf, ASTM D 624, Die C.
 - 5. Resistance to Water: Not more 2 percent volume change after 7 days immersion at 158 degrees F, ASTM D 741.
 - 6. Water Vapor Permeance: Not more than 0.06 Perm, ASTM E-96, Method B.
 - 7. Resistance to UV: No cracks, ASTM D 4637.
 - 8. Ozone Resistance: No cracks, ASTM D 1149.
- C. Product: Carlisle Pre-Kleened EPDM Thru-Wall Flashing or approved substitution.

2.03 ACCESSORIES

- A. Basis of Design by Carlisle Coatings & Waterproofing, Incorporated or approved substitution.
 - 1. Splice Tape: SURE-SEAL™ SecurTape or equal by manufacturer.
 - 2. Splice Compound: SURE-SEAL™ In-Seam Sealant or equal by manufacturer.

3. Splice Tape Primer: SURE-SEAL™ HP 250 Primer or equal by manufacturer.
4. Splice Cleaner: Per manufacturer.
5. Bonding Adhesive: Water-based : SURE-SEAL™ Aqua Base 120 or equal by manufacturer.
6. Corners: Formed pre-manufactured Inside/Outside Corners.
7. Lap Sealant: SURE-SEAL™ Lap Sealant or equal by manufacturer.
8. Termination Bar: SURE-SEAL™ Termination Bar or equal by manufacturer.
9. Mastic: SURE-SEAL™ Water Cutoff Mastic or equal by manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Apply Product and Accessories according to Manufacturer's instructions and drawings.
- B. Apply Product to sound substrate. Do not apply over mechanically-attached water resistive barrier such as felt, paper or house wrap.
- C. Adhere, fasten or cast in place vertical termination of Product according to Manufacturer's instructions and drawings.
- D. Form watertight splices between neighboring pieces of Product using Splice Tape or Splice Compound, according to instructions in Manufacturer's literature.
- E. Install Product with kick-out at flat pitch, or preferably sloped to provide drainage to the exterior. Surfaces shall not be oriented so that water can pond on the through-wall flashing

3.02 SCHEDULE

- A. Install Product during or after construction of back-up wall.
- B. Install Product before or during installation of brick veneer.
- C. Lap water resistive barrier over vertical termination of Product on back-up wall. Lap and secure water resistive barrier according to water resistive barrier manufacturer's instructions and drawings.
- D. Integrate Product with adhered membrane air barrier, damp proofing or water-resistive barrier on back-up wall according to Manufacturer's instructions and drawings.

3.03 REPAIR AND PROTECTION

- A. Protect Product from damage during application and remainder of construction period.
- B. Inspect before covering and make repairs as necessary. Remove and replace damaged material.

END OF SECTION

This page intentionally left blank

**SECTION 07 71 00
ROOF SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof specialties, including copings and reglets.

1.02 REFERENCE STANDARDS

- A. NRCA (RM) - The NRCA Roofing Manual; 2025.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of reglets, coping.
- E. Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.04 WARRANTY

- A. Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment.

PART 2 PRODUCTS**2.01 COMPONENTS**

- A. Copings.
 - 1. Fabricated to sizes required; mitered, welded corners; concealed fasteners.
 - 2. Configuration: Concealed hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
 - 3. Wall Width: As indicated on drawings.
 - 4. Outside Face Height: As indicated on drawings.
 - 5. Inside Face Height: As indicated on drawings.
 - 6. Profile: As indicated on plans.
 - 7. Material: Formed aluminum sheet, 0.050 inch (1.3 mm) thick, minimum.
 - 8. Finish: Pre-coat Kynar 500.
 - 9. Color: To be selected by Architect from manufacturer's full range.
 - 10. Performance characteristics: Provide products conforming to the following.
 - a. Coping sections shall expand and contract freely while mechanically locked in place on continuous anchor cleats.
 - b. Coping sections shall lock to anchor cleats by mechanical pressure from support chairs.
 - c. All coping cover joints shall be underlaid with gutter/support chairs capable of draining water.
 - d. Length: Minimum of 10'-0" (3048 mm) by width as shown on details.
 - e. Vertical face and back leg heights: Standard 4" (100 mm) nominal unless indicated otherwise on plans.
 - f. Internal splice plates: Concealed with matching finish to maintain outside face continuity.
 - g. Coping Cleat: 20 gauge galvanized steel anchor cleat; 12" (305 mm) wide at 3'-0" on center - mechanically fastened.
 - h. Gutter/support chair: Metal Gutter Chair in color and finish to match coping cap.

- i. Fasteners: Stainless steel screw type with a minimum pull-out resistance of 240# (109 kg) as supplied by the manufacturer per substrate application. No exposed fasteners shall be permitted.
- 11. Accessories.
 - a. Corners, end caps, custom pieces as indicated and as required shall be shop fabricated.
 - b. All corners shall be shop mitred, seamed and made watertight.
- B. Reglets - Masonry.
 - 1. Performance characteristics: Provide products conforming to the following.
 - a. Masonry reglet shall consist of a two piece system comprising a formed reglet and formed counterflashing.
 - b. Metal - Reglet: .050 Aluminum (minimum).
 - 1) Copper at all copper roof locations.
 - c. Metal - Counterflashing: .040 Aluminum (minimum).
 - d. Fasteners: Type, material and spacing per manufacturer. No exposed fasteners permitted.
 - e. Finish: Pre-coat Kynar 500.
 - f. Color: As selected by Architect from manufacturer's full range.
 - 2. Accessories: Provide matching end caps, inside and outside corners per project conditions.
 - 3. Product: (Basis of Design or approved substitution).
 - a. W.P. Hickman Company; Drive-Lock In Wall Counter Flashing: www.wph.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Reglets - Surface Mounted.
 - 1. Performance characteristics: Provide products conforming to the following.
 - a. Surface mounted reglet shall consist of a two piece system comprising a formed reglet and formed counterflashing.
 - b. Metal - Reglet: .050 Aluminum (minimum).
 - 1) Copper at all copper roof locations.
 - c. Metal - Counterflashing: .040 Aluminum (minimum).
 - d. Fasteners: Type, material and spacing per manufacturer.
 - e. Finish: Pre-coat Kynar 500.
 - f. Color: As selected by Architect from manufacturer's full range.
 - 2. Accessories: Provide matching end caps, inside and outside corners per project conditions.
 - 3. Product: (Basis of Design or approved substitution).
 - a. W.P. Hickman Company; Drive-Lock To Wall Counter Flashing: www.wph.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
- C. Custom fabricated joints and covers as required by project conditions and as noted on plans.

2.03 PRODUCT HANDLING

- A. All materials shall be delivered in the manufacturer's original sealed, labeled containers.
- B. Store materials in a dry, protected, well-vented area. The contractor shall report damaged material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Remove protective plastic surface film (where applicable) immediately after installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
- B. Verify that other trades with related work are complete before installation.

- C. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- D. Refer to the construction documents, shop drawings and manufacturer's installation instructions.
- E. Coordinate installation with roof membrane manufacturer's instructions before starting.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

This page intentionally left blank

**SECTION 07 72 00
ROOF ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof curbs.
- B. Roof hatches - Factory fabricated.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; current edition.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.
- 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.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project, with design calculations for loadings and spacings.
 - 1. Show profiles, accessories, location, and dimensions.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Final Acceptance.

PART 2 PRODUCTS**2.01 ROOF CURBS**

- A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
 - 2. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.

3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 18 gauge, 0.048 inch (1.21 mm) thick.

2.02 ROOF HATCHES

- A. Roof Hatch Manufacturers:
 1. Acudor Products Inc; Galvanized Steel Roof Hatch: www.acudor.com/#sle.
 2. Bilco Company; Type S-50-TB: www.bilco.com/sle.
 - a. Basis of Design or approved substitution.
 3. Dur-Red Products: www.dur-red.com.
 4. Milcor, Inc: www.milcorinc.com.
 5. Nystrom, Inc: www.nystrom.com/#sle.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Hatches, General: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
 1. Style: Provide flat metal covers unless otherwise indicated.
 2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
 3. Thermally Broken Hatches: Provide insulation within frame and cover.
 4. For Ladder Access: Single leaf; 30 by 36 inches (762 by 914 mm).
 5. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.
- C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch (2.3 mm) thick.
 2. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid glass fiber, located on outside face of curb.
 3. Curb Height: 12 inches (305 mm) from finished surface of roof, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 1. Capable of supporting 40 psf (1.92 kPa) live load.
 2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch (2.3 mm) thick, liner 0.04 inch (1.0 mm) thick.
 3. Finish: Factory prime paint.
 4. Insulation: Manufacturer's standard 3 inch (76 mm) rigid polyisocyanurate.
 5. Gasket: EPDM, continuous around cover perimeter.
- E. Safety Railing System: Roof hatch manufacturer's standard accessory safety rail system mounted directly to curb.
 1. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
 2. Posts and Rails: Aluminum tube.
 3. Gate: Same material as railing; automatic closing with latch.
 4. Finish: Manufacturer's standard, factory applied finish.
 5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
 6. Mounting Brackets: Extruded aluminum, 3/8 inch (9mm) thick.
 7. Hinges and Fasteners: Type 316 stainless steel.
- F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
 1. Lifting Mechanisms: Compression spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
 2. Hinges: Heavy duty pintle type.
 3. Hold open arm with vinyl-coated handle for manual release.
 4. Latch: Upon closing, engage latch automatically and reset manual release.
 5. Manual Release: Pull handle on interior and exterior.
 6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

END OF SECTION

This page intentionally left blank

**SECTION 07 84 00
FIRESTOPPING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not.

1.02 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).
- D. ITS (DIR) - Directory of Listed Products; Current Edition.
- E. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- F. FM (AG) - FM Approval Guide; current edition.
- G. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- H. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - 2. Verification of minimum three years documented experience installing work of this type.
 - 3. Verification of at least five satisfactorily completed projects of comparable size and type.
 - 4. Licensed by local authorities having jurisdiction (AHJ).

1.05 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- B. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

- A. Gypsum Board Walls:
 - 1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
 - a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
 - 2. Head-of-Wall Joints at Concrete Over Metal Deck:
 - a. 1 Hour Construction: UL System HW-D-0034; Specified Technologies Inc. ES Elastomeric Firestop Sealant.
 - 3. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
 - a. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
 - 4. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs:
 - a. 1 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.

2.04 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
 - 2. Fire Ratings: See drawings for required systems and ratings.
- B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Any material meeting requirements.
- C. Firestopping at Combustible Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Any material meeting requirements.
- D. Firestopping at Cable Tray Penetrations: Any material meeting requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

This page intentionally left blank

**SECTION 07 92 00
JOINT SEALANTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.
- 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 C1193 - Standard Guide for Use of Joint Sealants; 2016.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 7. Sample product warranty.
 - 8. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - 2. Bostik Inc: www.bostik-us.com/#sle.
 - 3. Dow: www.dow.com/#sle.
 - 4. Henry Company: www.henry.com/#sle.
 - 5. Hilti, Inc: www.us.hilti.com/#sle.
 - 6. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
 - 7. Pecora Corporation: www.pecora.com/#sle.
 - 8. Sika Corporation: www.usa.sika.com/#sle.
 - 9. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 11. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
 - 12. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - 2. Bostik Inc: www.bostik-us.com/#sle.
 - 3. Dow: www.dow.com/#sle.
 - 4. Pecora Corporation: www.pecora.com/#sle.
 - 5. Sika Corporation: www.usa.sika.com/#sle.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 7. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
 - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.

- c. Other joints indicated below.
- 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
- D. Interior Wet Areas: Bathrooms and restrooms; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

- A. Colors: As selected by Architect from manufacturer's full range.

2.04 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - 5. Color: To be selected by Architect from manufacturer's full range.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: White.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- D. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Grade: ASTM C834; Grade - NF.

2.05 SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: Gray.

2.06 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

**SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Expansion joint cover assemblies for wall, ceiling, and _____ surfaces.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.03 SUBMITTALS

- A. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Expansion Joint Cover Assemblies:
 - 1. Construction Specialties, Inc; _____: www.c-sgroup.com/#sle.
 - 2. Nystrom, Inc; _____: www.nystrom.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.
- C. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.
- D. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

This page intentionally left blank

**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Commercial security hollow metal doors and frames.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- G. 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; 2024.
- H. 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; 2018a.
- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- J. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L. ASTM F1450 - Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities; 2012a.
- M. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
- N. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- O. ITS (DIR) - Directory of Listed Products; Current Edition.
- P. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- Q. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- R. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.
- S. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- T. NAAMM HMMA 863 - Guide Specifications for Detention Security Hollow Metal Doors and Frames; 2014.
- U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

- W. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- X. UL (DIR) - Online Certifications Directory; Current Edition.
- Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.
- E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. Doors and frames must be properly marked with door opening mark number to correspond with the schedule.
- D. Deliver all steel doors with corrugated edge protection and palletized to provide protection during transit and job storage.
- E. Inspect doors and frames upon delivery for damage. Minor damage is to be repaired, provided the repair is equal to new work and acceptable to the architect.
- F. Store doors and frames at the job site under cover. Place units on wood sills on the floor in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.

3. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
 4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 5. De La Fontaine Inc: www.delafontaine.com.
 6. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 7. Titan Metal Products, Inc: www.titanmetalproducts.com/#sle.
 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Commercial Security Hollow Metal Doors and Frames:
1. Krieger Specialty Products: www.kriegerproducts.com/#sle.
 2. Security Metal Products Corporation, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 3. Titan Metal Products, Inc: www.titanmetalproducts.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 4. Door Edge Profile: Manufacturers standard for application indicated.
 5. Typical Door Face Sheets: Flush.
 6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy Duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.
 2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
 4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
 5. Door Face Sheets: Flush.
 6. Weatherstripping: Refer to Section 08 71 00.
 7. Door Finish: Factory primed and field finished.
- B. Interior Doors, Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.

- d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.
- 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
- 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
- 4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- 5. Door Face Sheets: Flush.
- 6. Door Finish: Factory primed and field finished.
- C. Commercial Security Doors; Interior and Exterior:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
 - 2. Security Facility Swinging Door Assemblies: Comply with Grade 1 security characteristics, in accordance with NAAMM HMMA 863 and ASTM F1450 requirements.
 - 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 - 4. Door Thickness: As required to meet requirements indicated.
 - 5. Door Face Sheets: Flush.
 - 6. Door Finish: Factory primed and field finished.
 - 7. Hinge Rail and Reinforcement: Non-beveled edge, reinforced with continuous steel channel, 12 gauge, 0.093 inch (2.3 mm) minimum metal thickness, welded at 5 inch (127 mm) on center maximum, and compatible with 4-1/2 inch (114 mm) full mortise template and continuous geared hinges.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
 - 2. Frame Finish: Factory primed and field finished.
 - 3. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
 - 2. Frame Finish: Factory primed and field finished.
- D. Interior Door/Window Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door/window, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
 - 3. Frame Finish: Factory primed and field finished.
- E. Commercial Security-Resistant Door Frames: With same security resistance as door; full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
 - 1. Frame Metal Thickness: 12 gauge, 0.093 inch (2.36 mm), minimum.
 - 2. Frame Finish: Factory primed and field finished.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

- I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (102 mm) high to fill opening without cutting masonry units.
- J. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered corners; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: Specified in Section 08 71 00.
- D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 71 00.
- F. Comply with glazing installation requirements of Section 08 80 00.
- G. Coordinate installation of electrical connections to electrical hardware items.
- H. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Final Adjustments: Adjust operating doors and hardware items just prior to final inspection and acceptance by the Owner and Architect. Leave work in complete and proper operating condition.

Remove and replace defective work, including doors or frames that are damaged, bowed or otherwise unacceptable.

- C. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

3.06 PROTECTION

- A. Provide protective measures required throughout the construction period to ensure that door and frame units will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

**SECTION 08 14 16
FLUSH WOOD DOORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- E. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D. Samples: Submit two samples of door construction, 12 by 12 inch (300 by 300 mm) in size cut from top corner of door.
- E. Samples: Submit two samples of door veneer, 12 by 12 inch (300 by 300 mm) in size illustrating wood grain, stain color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Specimen warranty.
- J. Warranty, executed in Owner's name.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
 - 1. Work shall be in accordance with the Grade or the Grades Specified of the Architectural Woodwork Standards.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- D. Single Source Responsibility: A single manufacturer shall provide and install the work of this Section.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.
- D. Deliver materials only when the project is ready for installation and the general contractor has provided a clean storage area.
- E. Maintain indoor temperature and humidity within the range recommended by the Architectural Woodwork Standards for the location of the project.
- F. Coordinate fabrication, delivery, and installation with the general contractor and other applicable trades.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Haley Brothers: www.haleybros.com/#sle.
 - 2. Marshfield DoorSystems, Inc: www.marshfielddoors.com/#sle.
 - 3. VT Industries, Inc: www.vtindustries.com/#sle.
 - 4. Chappell Door Company: www.chappelldoor.net.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

- A. All Interior Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Select White Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Same species as face veneer.
 - 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet (3 m) of each other when doors are closed.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.

- C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
- D. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- E. Interior glazed opening doors shall be true one-piece lumber.
- F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- H. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. Manufacturers standard, in compliance with performance duty level indicated.
 - b. Sheen: As selected by Architect from manufacturer's full range.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 - 1. Size: As indicated on drawings.
- B. Glazing: See Section 08 80 00.
- C. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
 - 1. Door fit in rated assemblies shall be in strict compliance with fire rating limitations.
 - 2. No door shall be undercut more than 3/4 inch (19 mm).
 - 3. Undercut clearances:
 - a. From top of decorative floor covering: 1/2 inch (12.7 mm).
 - b. From top of non-combustible floor: 3/4 inch (19 mm) maximum.
 - c. From top of non-combustible sill or threshold: 3/8 inch (9.5 mm) maximum.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 08 31 00
ACCESS DOORS AND PANELS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall-mounted access units.

1.02 REFERENCE STANDARDS**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS**2.01 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Wall-Mounted Security Units (DE-7):
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Steel.
 - 3. Size: 24 by 48 inches (610 by 1219 mm).
 - 4. Door/Panel and Frame: Heavy duty.
 - 5. Security type lock as indicated.

2.02 WALL MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Babcock-Davis: www.babcockdavis.com/#sle.
 - 3. Karp Associates, Inc: www.karpinc.com/#sle.
 - 4. Milcor, Inc: www.milcorinc.com/#sle.
 - 5. Nystrom, Inc: www.nystrom.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Material: Steel.
 - 2. Style: Exposed frame with door surface flush with frame surface.
 - 3. Door Style: 12 gauge, .1046 inch (2.66 mm) Single thickness with rolled or turned in edges.
 - 4. Frames: 12 gauge, .1046 inch (2.66 mm), minimum thickness.
 - 5. Heavy Duty Single Steel Sheet Door Panels: 14 gauge, 0.0747 inch (1.89 mm), minimum thickness.
 - 6. Steel Finish: Primed.
 - 7. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
 - 8. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

- b. Latch/Lock: Tamperproof tool-operated cam latch.
- c. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.
- d. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

**SECTION 08 33 23
OVERHEAD COILING DOORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior coiling doors.
- B. Electric operators and control stations.
- C. Wiring from electric circuit disconnect to operators and control stations.

1.02 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; 2024.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- D. ITS (DIR) - Directory of Listed Products; Current Edition.
- E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- G. NEMA MG 00001 - Motors and Generators; 2024.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction and component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

- B. Manufacturer Warranty: Provide manufacturer warranty as follows: complete forms in Owner's name and register with manufacturer.
1. Door and components: Five years.
 2. Electrical operator and components: Five years.
 3. Finish: Five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
 2. Clopay Building Products: www.clopaydoor.com/#sle.
 3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
 4. Raynor Garage Doors: www.raynor.com/#sle.
 - a. DuraCoil Basis of Design or approved substitution.
 5. The Cookson Company: www.cooksondoor.com/#sle.
 6. Overhead Door: www.overheaddoor.com.
 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa) without undue deflection or damage to components.
 2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1 (RSI-value of 1.43).
 3. Nominal Slat Size: 3 inches (75 mm) wide x required length.
 4. Finish: Factory painted, color as selected by Architect from manufacturer's full range.
 5. Guide, Angles: Galvanized steel.
 6. Guides, Formed Sheet Metal: Galvanized steel.
 7. Hood Enclosure: Manufacturer's standard; primed steel.
 8. Electric operation.
 9. Mounting: As indicated on drawings.

2.03 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking slats.
1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
 3. Steel Slats: Minimum thickness, ASTM A653/A653M galvanized steel sheet.
 - a. Exterior: 18 gauge.
 - b. Interior: 22 gauge.
- B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- C. Guides - Angle: ASTM A36/A36M metal angles, size as required for wind loading.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.
 2. Prime painted.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
- E. Lock Hardware:
1. Latchset Lock Cylinders: Standard mortise cylinder.
 - a. Keying: Master keyed.
 2. For motor operated units, additional lock or latching mechanisms are not required.

- F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

2.04 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
 - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Motor Enclosure:
 - a. Exterior Coiling Doors: NEMA MG 00001, Type 4; open drip proof.
 - 3. Motor Rating: 1/2 HP (375 W); continuous duty.
 - 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 - 6. Controller Enclosure: NEMA EN 10250, Type 4.
 - 7. Opening Speed: 12 inches per second (300 mm/sec).
 - 8. Brake: Manufacturer's standard type, activated by motor controller.
 - 9. Manual override in case of power failure.
 - 10. Security feature for integration with security system.
 - 11. See Section 26 05 83 for electrical connections.
- C. Control Station: Provide standard key-operated, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
 - 1. 24 volt circuit.
 - 2. Surface mounted, at interior door jamb.
 - 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 26 05 83.
- F. Complete wiring from disconnect to unit components.
- G. Install enclosure and perimeter trim.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).

- C. Maximum Variation From Level: 1/16 inch (1.6 mm).

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

**SECTION 08 34 61
BULLET RESISTANT WOOD DOORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Bullet-resistant wood door and steel frame assemblies.

1.02 REFERENCE STANDARDS

- A. American Welding Society (AWS) 1.3/D1.3M - Structural Welding Code - Sheet Steel.
- B. ASTM International (ASTM) www.astm.org A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- C. Underwriters Laboratories (UL) 52 - Bullet Resisting Equipment.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide door and frame assemblies of "non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Provide hardware templates to door and frame assembly manufacturer for preparation of door and frame units to receive hardware other than hinges.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Include door and frame profiles and sizes, type and spacing of frame anchors, reinforcement size and locations, details of joints and connections, and welding details.
- C. Product Data: Include product description for door and frame assemblies including bullet-resistant ratings.
- D. Closeout Submittals:
 - 1. Maintenance Data: Include instructions for cleaning of glazed panels.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.
- C. Door and Frame Assemblies: Ballistic Level 2 tested to UL 752.
- D. Doors and frames manufactured by same firm.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store door and frame assemblies upright in protected, dry area, off ground or floor, with at least 1/4 inch space between individual units.
- B. Do not cover with non-vented coverings that create excessive humidity.
- C. Remove wet coverings immediately.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Armortex: www.armortex.com.
- B. Total Security Solutions: www.tssbulletproof.com.
- C. Insulgard: www.insulgard.com.
- D. Substitutions: See Section 01 60 00 – Product Requirements.

2.02 MATERIALS

- A. Wood: Select White Maple, premium grade veneer, rotary cut, certified to FSC STD-04-004.
- B. Steel Sheet:
 - 1. ASTM A1008/1008M, cold rolled, free from scale, pitting, coil breaks, and other surface defects.
- C. Bullet-Resistant Composite: UL Listed Bullet Resistant Composite of UL level equal to specified door and frame ballistic protection level.

2.03 ACCESSORIES

- A. Hinges: Aluminum continuous gear type.

2.04 FABRICATION

- A. Doors:
 - 1. Solid core construction wood veneer faces, bullet-resistant composite core and solid 3/8 inch thick wood stile and rail edges of same species as veneer.
 - 2. Factory hang doors in frames using specified hinges.
 - 3. Mortise and reinforce doors and frames at factory to receive hardware in accordance with approved hardware schedule.
 - 4. Vision Panels: Clear laminated glass of same ballistic level as door and frame assembly.
- B. Frames:
 - 1. Same ballistic protection as doors.
 - 2. Fabricate from 16 gage steel lined with bullet-resistant composite.
 - 3. Weld frame corners; knock-down and mechanical joints not acceptable.
- C. Welding: In accordance with AWS D1.3/D1.3M. Grind exposed welds flush and smooth.
- D. Finish work neat and free from defects.
- E. Allowable Tolerances: Plus or minus 1/16 inch for frame opening width, height, diagonal dimensions, and overall width and height (outside to outside).

2.05 FINISHES

- A. Wood: Unfinished, for field-applied finish to match adjacent pre-finished doors.
- B. Steel:
 - 1. Dress tool marks and surface imperfections to smooth surfaces.
 - 2. Clean and chemically treat steel surfaces.
 - 3. Apply manufacturer's standard rust inhibiting gray primer paint.
- C. Aluminum: Clear anodized.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install door and frame assemblies in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Set plumb, square, and level.
- C. Secure to adjacent construction using fastener type best suited to application.
- D. Drill and tap for surface-mounted hardware in field. Install hardware in accordance with Section 08 71 00 – Door Hardware.
- E. Field alterations to door and frame assemblies other than drilling and tapping for surface-mounted hardware not permitted unless approved in advance by manufacturer and Architect.

3.02 ADJUSTING

- A. Touch up minor scratches and abrasions in primer paint to match factory finish.

- B. Adjust doors to swing freely, without sticking or binding.

END OF SECTION

This page intentionally left blank

**SECTION 08 34 63
DETENTION DOORS AND FRAMES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Detention hollow metal doors and frames.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanneal) by the Hot Dip Process.
- B. ASTM A666-10 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
- C. ASTM A1008/A1008M-13, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- D. ASTM A1011/A1011M-14, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- E. ASTM F1450-12a, Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention Facilities.
- F. ASTM F1577-05 (2012), Standard Test Methods for Detention Locks for Swinging Doors.
- G. ASTM F1592-12, Standard Test Methods for Detention Hollow Metal Vision Systems.
- H. ASTM F1643-05 (2012), Standard Test Methods for Detention Sliding Door Locking Device Assembly.
- I. ANSI A250.10 – 1998, Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- J. ANSI/NAAMM/HMMA 863-04, Guide Specifications for Detention Security Hollow Metal Doors and Frames.
- K. ANSI/NAAMM/HMMA 840-07, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- L. ANSI/NAAMM/HMMA 801-12, Glossary of Terms for Hollow Metal Doors and Frames.
- M. ANSI/NAAMM/HMMA 850-00, Fire-Rated Hollow Metal Doors and Frames, Third Edition.
- N. ANSI/NAAMM/HMMA 866-12, Guide Specifications for Stainless Steel Hollow Metal Doors and Frames.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data.
- C. Shop Drawings: Include the following at a minimum:
 - 1. Door and frame elevations and sections.
 - 2. Schedule of openings, including dimensions, gauges, anchors and label requirements.
 - 3. Manufacturer's standard instructions for frame installation and for material handling and storage.
 - 4. Location and detail of openings in frames and doors.
 - 5. Glazing types and stops.
 - 6. When a fire resistance classification is shown or scheduled for detention hollow metal doors or frames provide fire rated doors with recognized testing laboratory labels affixed. Identify openings that may not receive labels due to hardware, dimensional, or other limitations. For

such openings, provide certification that the door and frame components have been constructed in accordance with the requirements of the testing laboratory.

- D. Samples:
 - 1. Door: 12" x 12" corner section with hinge preparation showing top and internal construction.
 - 2. Frame: 12" x 12" corner section showing weld joint of head to jamb. Include hinge mortise, reinforcement and mortar guard in one rabbet, and glazing stop applied as specified in the opposite rabbet. Glazing stop shall be applied to both head and jamb section to show corner joint.
 - 3. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any downgrading of quality demonstrated by comparison with the samples may be cause for rejection of the work.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least ten years of documented experience.
 - 1. A list of completed projects including not fewer than five (5) that have been successfully in operation for at least (5) years, including contacts at each facility with addresses and phone numbers.
 - 2. Evidence of ISO 9001 certification.
- C. Fabricator Qualifications: Company specializing in fabricating products specified in this section, with at least ten years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- E. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions, erection drawings, and shop drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Packing and Marking: Mark each piece according to the approved erection drawings.
- C. Inspect all components upon delivery for damage. Damages may be repaired, provided the finish items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.
- D. Store all components at the building site under cover. Do not store any materials directly on the ground or concrete. Provide adequate ventilation and protection to insure materials are kept dry, clean and secure. Store all materials in the manner and order as prescribed by the manufacturer.
- E. The contractor responsible for installation shall remove wraps or covers from doors and frames upon delivery at the building site. The contractor responsible for installation shall see that any scratches or disfigurement caused in shipping or handling are promptly sanded smooth, cleaned, and touched up with a compatible rust inhibitive primer.
- F. The contractor responsible for installation shall see that materials are properly stored on planks in a dry location. Doors shall be stored in a vertical position and spaced by blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer Warranty: Provide 1 year manufacturer warranty. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. American Steel – Cornelia, GA.
- B. Trussbilt, LLC – New Brighton, MN.
- C. Titan Steel Door – Murrayville, GA.
- D. Architectural Openings – Longwood, FL.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TESTING AND PERFORMANCE

- A. Detention hollow metal doors and frames shall meet the following minimum test standards. Compliance with test requirement shall be certified by reports of independent testing agencies. Test reports shall indicate the construction of the samples tested with sufficient particularity that construction can be verified.
 - 1. Certification: Provide a current independent testing laboratory report and certification in compliance with ASTM F1450, ASTM F1592 and NAAMM HMMA 863, paragraph 1.06, D; HMMA 863, paragraph 1.06, E, certifying minimum performance data for manufacturer's production maximum security door panels, frames and hardware as specified and indicated.
 - a. Test Specimens: Test doors shall be 3'0"W x 7'0"H (914mm x 2134mm) with 100 square inch vision panel, 4" x 25" (102mm x 635mm) clear opening, positioned generally as shown in ASTM F1450. Test doors and frames shall be prepared for hardware as specified in ASTM F1450.
 - 2. Door Static Load Test: Doors shall be tested in accordance with procedures outlined in ASTM F1450, 7.3 – "Door Static Load Test."
 - 3. Door Rack Test: Doors shall be tested in accordance with procedures outlined in ASTM F1450, 7.4 – "Door Rack Test."
 - 4. Door Assembly Impact Test: Two 3'0" x 7'0" (914mm x 2134mm) doors shall be constructed in accordance with Article 2.1 of this Section, with 100 square inch (64 516mm²) vision panel, 4 in. x 25 in. (102mm x 635mm) clear opening positioned generally as shown in ASTM F1450, Figure 3. Two frames shall be constructed in accordance with Article 2.3 of this Section. Test doors and frames shall be prepared and furnished with hardware, installed and tested in accordance with ASTM F1450, Section 6, "Specimen Preparation" and Section 7.2 "Door Assembly Impact Test."
 - 5. Detention Hollow Metal Vision System Impact Test: Four (4) equal light multi-light security hollow metal assemblies, overall dimensions of 50 in. (1270 mm) wide x 50 in. (1270 mm), shall be constructed in accordance with Section 2.3, and shall be impact tested in accordance with ASTM F1592, Sections 5, 6 and 7.2. The test assembly shall meet the acceptance criteria in Section 7.2 in order to qualify under this Section. A single sidelight security hollow metal assembly, door dimensions 3 ft. 0 in. x 7 ft. 0 in. (914 mm x 2134 mm) and sidelight dimensions with clear opening size of 28 in. wide x 33 in. high +/- 1 in. (711 mm x 838 mm +/- 25 mm), shall be constructed in accordance with Articles 2.1 and 2.3 of this Section, and shall be impact tested in accordance with ASTM F 1592, Sections 5, 6 and 7.2. The test assembly shall meet the acceptance criteria in Section 7.2 in order to qualify under this Section.
 - 6. Door Edge Crush Test: Two (2) doors constructed identical to each of the test doors required in the "Door Assembly Impact Test," 3'0" x 7'0" (914mm x 2134mm), with 4 in. x 25 in. (102mm x 635mm) vision panel and with hardware preparations shall be tested in accordance with ASTM F1450, Paragraph 7.7 "Door Edge Crush Test."
 - 7. Bullet Resistance Test: Where specified on individual openings, bullet resistance shall be certified by the application of the laboratory bullet resistance rating label on the door for the opening indicating compliance with the testing procedure described in UL Standard 752, and

consistent with ASTM F1450, Section 6, "Specimen Preparation" and Paragraph 7.1 "Bullet Penetration." The bullet resistance rating shall be Level 3.

- B. All door and frame construction shall be in accordance with construction of assemblies that meet the requirements of specifications above.
- C. The detention hollow metal manufacturer shall submit a notarized certificate stating that the construction, materials, and methods used are in accordance with these specifications and have been proven to meet performance standards described in specifications above.
- D. Fabrication methods and product quality shall meet standards set by the Hollow Metal Manufacturers Association, HMMA, a division of the National Association of Architectural Metal Manufacturers, NAAMM, as set forth in these specifications.
- E. Fire rated doors and frames shall be provided for those openings indicated in the schedule as requiring fire protection ratings. Such doors and frames shall be constructed as tested in accordance with ASTM E152/UL 9/UL 10C and approved by a recognized testing agency having a factory inspection service.
- F. If any door or frame specified in the contract documents to be fire rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, fabrication of the affected item shall not begin until the issue is satisfactorily resolved, and the resolution is approved.
- G. At the Owner's option, a door at the job site shall be selected at random and sawed in half or otherwise taken apart as deemed necessary for verification that construction is in accordance with these specifications. The manufacturer shall include the cost of the replacement door in its quotation. If the door construction does not conform to these specifications the non-conforming doors shall be repaired or replaced at the manufacturer's expense.

2.03 DETENTION HOLLOW METAL DOORS

- A. Door Materials:
 - 1. Doors shall be constructed of commercial quality, level, cold-rolled steel conforming to ASTM A 1008/1008M or hot rolled, pickled and oiled steel conforming to ASTM A1011/1011M. The steel shall be free of scale, pitting, coil breaks or other surface blemishes. The steel shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
 - 2. Exterior Doors:
 - a. Face sheets shall be 14 gauge or 12 gauge minimum thickness as indicated in the door schedule.
 - b. Face sheets shall be galvanized or have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot Dip Process.
 - 3. Interior Doors:
 - a. Face sheets shall be 14 gauge or 12 gauge minimum thickness, as indicated in the door schedule.
 - 1) For areas subject to severe corrosion (shower areas, etc.) face sheets shall be 14 or 12 gauge minimum thickness as indicated in the door schedule and shall be galvanized or have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot Dip Process.
- B. Door Construction:
 - 1. Manufacturer's door reinforcements and fabrication techniques shall be consistent with, or more substantial than, the construction employed in doors tested to demonstrate compliance with the performance requirements herein.
 - 2. Doors shall be internally reinforced with one of the following systems:
 - a. Continuous steel truss design core material, 28 gauge minimum, having truncated triangular sections extending continuously from one door face to the other, spot welded to each face 2-3/4" (19mm) oc horizontally and 3" (76.2mm) oc vertically. Core material to extend full height and width of door.

- b. Continuous vertical hat sections, one such hat section welded to each face of the door, 16 gauge minimum, with vertical webs no more than 4" (101.6mm) apart, spot welded to faces no more than 3" (76.2mm) oc vertically. Hat sections shall be welded to each other at least every 6" (152.4mm) oc both sides in order to prevent door separation. An additional full height edge stiffener in the form of a 1/8" (3.17mm) channel shall be installed and welded to both faces not more than 4" (101.6mm) oc.
- 3. Top and bottom of the door shall be closed with a 14 (1.90mm) gauge formed channel. Top and bottom closing channels shall be welded to the edge reinforcing. Top and bottom of doors shall be finished flush with an additional inverted channel of not less than 14 (1.90mm) gauge.
- 4. Hinge reinforcements shall be minimum 7 gauge (0.170 in) (4.76mm) thick of the size and shape utilized in testing. They shall be projection welded to the door edge, and after installation additionally electrically spot welded to the door edge. In addition, a backup channel stiffener of not less than 14 (1.90mm) gauge shall be welded to each hinge reinforcing and to each door face, to prevent rocking failure of the hinge reinforcing.
- 5. Swing door edges shall be beveled 1/8" (3.17mm) in 2" (50mm). Sliding doors shall have square edges.
- 6. Doors shall be reinforced, drilled, tapped and prepared for templated mortised hardware only, in accordance with a final approved hardware schedule and templates provided by the hardware supplier. Where surface hardware is to be applied, doors shall be reinforced only. Reinforcing dimensions shall be as follows:
 - a. Surface Mounted Hinges – Minimum 3/8" (9.53mm) reinforcing.
 - b. Mortised Hinges and Pivots – 7 gauge (0.170 in) (4.76mm).
 - c. Internal Reinforcing for Other Hardware – 12 (2.78mm) gauge.
- 7. Louvers (if required) shall be of the inverted Y type with blades formed from 12 gauge minimum material and positioned so that no rigid flat object can be passed through them.
- 8. Speaking devices shall consist of a rectangular pattern of round holes, not exceeding 1/4" (6.35mm) in diameter in both face sheets. The hole pattern shall be at least 4" (101.6mm) by 5" (127mm). The space between the hole patterns shall be baffled with steel sections of not less than 18 (1.21mm) gauge so that objects cannot be passed through.
- 9. Glass moldings and stops:
 - a. Where specified, doors shall be provided with steel moldings to secure glazing by others in accordance with glass sizes and thicknesses shown on approved submittal drawings.
 - b. Fixed glass molding shall be not less than 0.093 in. (2.3mm) and shall be spot welded to both face sheets 5.0 in. (127mm) o.c. maximum.
 - c. In glass openings where security glazing is specified and where shown on the approved submittal drawings, pressed steel angle glazing stops, no less than 0.093 in. (2.3mm) thickness, shall be provided. Angle stops shall be mitered or notched and tight fitting at the corner joints and secured in place using 1/4 – 20 or 1/4 – 28 button head tamper resistant machine screws with spacing necessary to satisfy the performance criteria outlined in Section 1.06A spaced 2 in. (51mm) maximum from each end and 9 in. (230mm) o.c. maximum.
- 10. Food Pass/Cuff Port Openings:
 - a. The food pass opening shall be fabricated using 10 gauge (3.42mm) interior channels securely welded to the inside of both face sheets. Reinforcing for food pass locks and hinges shall be 10 gauge (3.42mm) channel. The clear opening shall be as shown on the architectural drawings. The four corner seams shall be continuously arc welded. The finished opening shall be of such construction that it cannot be dismantled or otherwise affected by tampering or scraping.
 - b. The food pass shutter shall be constructed from 10 gauge (3.42mm) steel plate. The overall shutter size shall overlap the opening by 1/2" (12.7mm) minimum on all sides.
 - c. The shutters shall be chemically treated for maximum paint adhesion and primed in accordance with the requirements of this Section. Shutters and food pass hardware shall be factory installed.

11. Doors shall have the Architect's mark number permanently stamped on the 2nd hinge from the bottom hinge reinforcement for swing doors and on sliding doors with vision lite on fixed glazing channel, with no vision on bottom filler channel.
12. If directed by the Architect, the Installer shall destroy a randomly selected detention hollow metal door by sawing it in half (horizontally). When examination disclosed door construction at variance with the details shown in performance test reports, the door manufacturer shall replace all non-conforming doors shipped to the project with doors constructed in conformance with construction of doors tested. Under conditions of non-conformity, the door manufacturer shall pay for the destroyed door and related labor. When examination proves that the door construction is consistent with tested doors, the owner will pay to replace the destroyed door and related labor.

2.04 DETENTION HOLLOW METAL FRAMES

A. Frame Materials:

1. Frames shall be constructed of commercial quality, cold rolled steel conforming to ASTM A 1008/1008M or hot rolled, pickled and oiled steel conforming to ASTM A1011/1011M. The steel shall be free of scale, pitting, coil breaks or other surface defects.
2. Exterior openings: Steel for these openings shall be 12 gauge minimum thickness galvanized or shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot Dip Process.
3. Interior openings: Steel for these openings shall be 12 gauge minimum thickness. Where scheduled, interior frames shall be galvanized or have a zinc coating conforming to ASTM A 653/A 653M Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot Dip Process.

B. Frame Construction:

1. All frames shall be 12 gauge (2.66mm). All frames shall be formed of hot or cold rolled steel produced in accordance with ASTM A1008 or ASTM A1011.
 - a. Frames scheduled as galvanized shall be in accordance with ASTM A653 (A60).
 - b. Frames shall be straight, neat in appearance, and free of warpage and buckling.
 - c. All frame joints shall be welded, except where overall size of frame precludes shipment or erection in which case appropriate splices shall be provided for field erection by others.
2. Jamb, head and sill profiles shall be as scheduled or shown in architectural drawings. Stop height for frames shall be 1-1/4"(31.75mm) for glass openings and 5/8"(15.87mm) for door openings.
3. Corner joints shall have all contact edges closed tight with faces mitered and stops butted or mitered. Corner joints shall be continuously welded and the use of gussets or splice plates is unacceptable.
4. Frames for multiple openings shall have mullion members which are closed tubular shapes conforming to profiles shown on drawings and which have no visible seams or joints.
5. Frames shall have the architect's door number permanently stamped in the center hinge reinforcement. Where frames do not receive hinge preparation, number shall be stamped in a prominent location, where it will not be visible after installation.
6. Frames shall be mortised, reinforced, drilled and tapped for all templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware manufacturer. Where surface mounted hardware is to be applied, frames shall be reinforced only. The installer shall do all drilling and tapping.
7. Mortised hinge and pivot reinforcement shall be a minimum of 3/16" (4.76mm) thick, 1-1/2" (38.1mm) wide and 10" (254mm) long. Reinforcements shall be projection welded to the frame and shall be MIG welded to the frame at top and bottom of each reinforcing. The top hinge shall be additionally reinforced with a 3/16" (4.76mm) thick formed angle welded both to hinge reinforcing and frame face.
8. Drilling and tapping of frames for surface mounted hinges shall be by installer, after door is fitted plumb and true into frame.
9. The following applications shall be reinforced as indicated:

- a. Lock Bolt Opening Backup: 12 gauge minimum (2.66mm).
 - b. Surface Mount Closers: 12 gauge minimum (2.66mm).
 - c. Concealed Closers: 3/16" minimum (4.76mm).
 - d. Strike Mounting Clips: 3/16" minimum (4.76mm).
10. Floor Clips shall be provided of same gauge as the frame and shall be welded in place at the bottom of each jamb. They shall have two holes for anchoring to floor. If so scheduled, adjustable floor clips shall be provided.
 11. Frames shall be caulked in order to limit leakage of grout into frame openings.
 12. Masonry Jamb Anchors: Provide a minimum of three (3) "T" type corrugated masonry anchors for each jamb mounted in masonry up to 84" (2,134mm) in height. Anchors shall have holes in them permitting insertion of reinforcing bar. For longer jambs, provide sufficient anchors to permit maximum spacing of 24". Where dictated by fire rating testing laboratory procedures, supply anchors complying with such requirements.
 13. Grout Guards of not less than 24 gauge (0.61mm) steel shall be welded in place at all hardware mortises on frames to be set in masonry or concrete. Guards for closers shall be 18 gauge minimum (1.21mm).
 14. All frames shall be provided with two temporary steel spreaders welded to the feet of the jambs to serve as bracing during shipping and handling only. These shall be removed prior to installation and are not to be used for setting of proper frame tolerances.

2.05 CLEARANCES AND TOLERANCES

- A. Edge clearances for swinging doors shall not exceed the following:
 1. Between doors and frames at head and jambs: 1/8".
 2. Between edges of pairs of doors: 1/8".
 3. At door sills where a threshold is used: 3/8".
 4. At door sills where no threshold is used: 3/4".
- B. Manufacturing tolerance shall be maintained within the following limits:
 1. Frames for single or pair of doors:
 - a. Width measured between rabbets at the head: Nominal opening width +1/16", -1/32".
 - b. Height (total length of jamb rabbet): Nominal opening height $\pm 3/64$ ".
 - c. Cross sectional profile dimensions:
 - 1) Face: $\pm 1/32$ ".
 - 2) Stop: $\pm 1/32$ ".
 - 3) Rabbet: $\pm 1/32$ ".
 - 4) Depth: $\pm 1/32$ ".
 - 5) Throat: $\pm 1/16$ ". Frames overlapping walls to have throat dimension 1/8" greater than dimensioned wall thickness to accommodate irregularities in wall construction.
 2. Doors:
 - a. Width: $\pm 3/64$ ".
 - b. Height: $\pm 3/64$ ".
 - c. Thickness: $\pm 1/16$ ".
 - d. Hardware cutout dimensions: Template dimensions +0.015"-0".
 - e. Hardware location: $\pm 1/32$ ".
 - f. Edge Flatness: $\pm 1/16$ in. (1.6 mm).
 - g. Bow/Flatness: $\pm 1/8$ ".

2.06 HARDWARE LOCATIONS

- A. The location of hardware on doors and frames shall be as listed below. All dimensions except the hinge locations are referenced from the finished floor. When hollow metal frames only are specified for use with doors to be furnished by others, the hardware preparation on the door is to be governed by its location on the frame. The door supplier is responsible for coordinating hardware locations.
- B. Hinges:
 1. Top: 5" from frame head to top of hinge.
 2. Bottom: 10" from finished floor to bottom of hinge.

- 3. Intermediate: centered between top and bottom hinges.
- C. Unit and integral type locks and latches: 40-5/16" to centerline of strike.
- D. Deadlocks: 48" to centerline of strike.
- E. Exit hardware: 38" to centerline of cross bar.
- F. Door pulls: 42" to centerline of grip.
- G. Push/pull bars: 42" to centerline of bar.
- H. Arm pulls: 47" to centerline.
- I. Push plates: 48" to centerline of plate.

2.07 FINISH

- A. After fabrication, all tool marks and surface imperfections shall be filled and sanded as required to make exposed surfaces smooth and free from irregularities.
- B. After appropriate metal preparation, all exposed surfaces shall receive a rust inhibitive primer that meets or exceeds the requirements specified in ANSI/SDI A250.10 and ANSI/NAAMM HMMA 863-04.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Contractor responsible for installation of frames shall perform the following in accordance with HMMA 840:
 - 1. Prior to installation, all frames shall be checked for size, swing, and with temporary spreaders removed, corrected for squareness, alignment, twist and plumbness. Permissible installation tolerances shall not exceed the following:
 - a. Squareness: $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the other jamb.
 - b. Alignment: $\pm 1/16$ " measured on jambs on a horizontal line parallel to the plane of the wall.
 - c. Twist: $\pm 1/16$ " measured on jambs on horizontal lines perpendicular to the plane of the wall.
 - d. Plumbness: $\pm 1/16$ " measured on the jamb at the floor.
 - 2. These tolerances provide a guideline for proper installation of hollow metal frames. The cumulative effect of the tolerances at their maximum levels will result in sufficient misalignment to prevent the door from functioning properly. Installers should take care not to create a tolerance buildup. Tolerance buildup occurs when more than one dimension is at or near its maximum tolerance.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Frame jambs shall be fully grouted by contractor responsible for grouting to provide added security and protection against battering, wedging, spreading and other means of forcing open the door. Jamb mounted lock preparations, grout guards for hardware preparations, glazing stop screws and junction boxes are intended to protect hardware mortises, tapped mounting holes and exposed removable screws from masonry grout of 4" maximum slump consistency which is hand troweled in place. If a light consistency grout (greater than 5" slump when tested in accordance with ASTM C 143) is to be used, special precautions shall be taken in the field by the installation contractor to provide protection from grout.
- C. Frames shall not be used as forms for grout or concrete. Grouting of hollow metal frames shall be done in "lifts" or precautions shall be otherwise taken by the grouting contractor to insure that frames are not deformed or damaged by this process.
- D. All grout or other bonding material shall be cleaned off of frames or doors by the responsible contractor immediately following installation. Frame and door surfaces shall be kept free of grout, tar, or other bonding material or sealer.

- E. Maintain proper door clearances in accordance with these specifications, except for special conditions otherwise noted.
 - 1. Where necessary, metal hinge shims are acceptable to maintain clearances.

3.03 FINISH

- A. Primed or painted surfaces that have been scratched or otherwise marred during installation (including field welding) and/or cleaning shall promptly be finished smooth, cleaned, treated for maximum paint adhesion, and touched up with a rust inhibitive primer comparable and compatible to shop applied primer.
- B. Painting contractor shall finish paint detention hollow metal doors and frames in accordance with requirements of Division 09. The firm having responsibility for finish painting under Division 09 shall correct incidental paint damage occasioned by installation of hardware items.

3.04 CLEANING

- A. Clean in accordance with manufacturer's written instructions.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for additional submittals.
- B. See Section 01 79 00 - Demonstration and Training for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Training Reference: Operation and maintenance manual and additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Manufacturer's training personnel.

END OF SECTION

This page intentionally left blank

SECTION 08 43 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Infill panels of spandrel glass.
- C. Aluminum doors.
- D. Weatherstripping.

1.02 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- K. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- L. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

- D. Samples: Submit two samples 6x6 inches (150x150 mm) in size illustrating finished aluminum surface, glass, glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- D. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.08 WARRANTY

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum-Framed Storefronts Manufacturers:
 - 1. Kawneer North America: www.kawneer.com/#sle.
 - a. Product - Exterior Curtainwall - Typical: 1600 System 01 / SS, 7.5"x2.5" / 6.5"x2.5", Basis of Design
 - b. Product - Exterior Storefront - Typical: Trifab VG 601T, Basis of Design or approved substitution.

- c. Product - Interior Sotrefront: Trifab VG 450, Basis of Design or approved substitution.
- d. Product - Doors: 550 Medium Stile, Basis of Design or approved substitution.
- 2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
- 3. Tubelite, Inc: www.tubeliteinc.com/#sle.
- 4. EFCO Corporation: www.efcocorp.com.
- 5. YKK AP America Inc.: www.ykkap.com.
- 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Rabbet - Exterior Applications: For 1 inch (25 mm) insulating glazing.
 - 2. Glazing Rabbet - Interior Applications: For 1/4 inch (6 mm) monolithic glazing.
 - 3. Glazing Position - Exterior Applications: Front-set.
 - 4. Glazing Position - Interior Applications: Centered (front to back).
 - 5. Finish - Exterior Applications: Class I natural anodized.
 - 6. Finish - Interior Applications: Class II natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 7. Finish Color - Exterior Applications: Clear.
 - 8. Finish Color - Interior Applications: Clear.
 - 9. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 10. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 11. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 12. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 - 13. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 - 14. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 15. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
 - 16. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.
- B. Performance Requirements
 - 1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - 1) Basic Wind Speed (MPH): 120 mph.
 - 2) Importance Factor: 1.1.
 - 3) Exposure Category: B.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 - 2. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.

C. Components

1. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
 - a. Framing members for interior applications need not be thermally broken.
 - b. Glazing Stops: Flush.
 - c. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
2. Glazing: See Section 08 80 00.
3. Swing Doors: Glazed aluminum.
 - a. Thickness: 1-3/4 inches (43 mm).
 - b. Bottom Rail: 10 inches (254 mm) wide.
 - c. Glazing Stops: Beveled.
 - d. Finish: Same as storefront.

D. Materials

1. Extruded Aluminum: ASTM B221 (ASTM B221M).
2. Sheet Aluminum: ASTM B209/B209M.
3. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
4. Structural Steel Sections: ASTM A36/A36M; shop primed.
5. Fasteners: Stainless steel.
6. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.
7. Concealed Flashings: Galvanized steel, 26 gauge, 0.0179 inch (0.45 mm) minimum base metal thickness.
8. Sealant for Setting Thresholds: Non-curing butyl type.
9. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
10. Glazing Accessories: See Section 08 80 00.
11. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

E. Finishes

1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
2. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils (0.01 mm) thick.
3. Touch-Up Materials: As recommended by coating manufacturer for field application.

F. Hardware

1. For each door, include weatherstripping, sill sweep strip, and threshold.
2. Other Door Hardware: See Section 08 71 00.
3. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
4. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
5. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior doors.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install system in accordance with manufacturer's instructions.

- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- D. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

This page intentionally left blank

SECTION 08 43 33
BULLET RESISTANT ALUMINUM-FRAMING SYSTEM

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Bullet resistant aluminum-framing system.
- B. Bullet resistant aluminum door assemblies.
- C. Bullet resistant glazing.

1.02 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- F. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide for each type of framing and glass including manufacturer recommended installation instructions.
- C. Shop Drawings: Include plans, elevations, sections, details, attachment to other work and glazing details.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- F. Samples:
 - 1. Selection Sample: Color charts consisting of actual product pieces, demonstrating full range of available colors, for initial color selection.
 - 2. Verification Samples: Submit two samples 6x6 inches (150x150 mm) in size illustrating finished aluminum surface.
 - 3. Submit two samples 6x6 inches (150x150 mm) of glazing.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- D. Source Limitations: Obtain bullet resistant aluminum framed system through one source from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.08 WARRANTY

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Insulgard Security: www.insulgard.com.
 - 1. Basis of Design or approved substitution.
- B. Armortex: www.armortex.com.
- C. C.R. Laurence Co. Inc: www.crl-arch.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING

- A. Product: Insulgard Security 44/450, Basis of Design or approved substitution.
- B. Description:
 - 1. Factory fabricated framing constructed from either 6105-T5 or 6005-T5 extruded aluminum.
 - 2. Dimensions:
 - a. Head, Jamb, Sill and Mullion Members: 2-1/2 inches by 4 1/2 inches.
- C. Performance Criteria:
 - 1. Wind Loading: Interior - 5psf.
 - 2. Deflection Limits
 - a. Deflection of any framing member in a direction normal to the plane of the wall when subjected to the indicated design loads shall not exceed $l/175$ of its clear span or $3/4$ inch, whichever is less.
 - b. For cantilevers, the span shall be taken as two times the distance between anchor centerline and end of cantilever.
 - c. The deflection shall not exceed 50 percent of the nominal joint width at sealant joints occurring between framing members and adjacent materials, unless otherwise required by sealant manufacturer.

- d. Upon reversal of load direction at magnitudes up to and including 1.5 times design pressures, slippage at fastened and/or clamped connections, shall not exceed 1/8 inch.
 - e. Glass deflection at full design load shall not exceed 1/100 of its span, or 3/4 inch, whichever is less.
- D. Ballistic Resistance:
- 1. Level 2 in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing and panels.
- E. Finish: Class I natural anodized.
- 1. Factory finish all surfaces that will be exposed in completed assemblies.
- F. Materials
- 1. Extruded Aluminum: ASTM B221 (ASTM B221M).
 - 2. Structural Steel Sections: ASTM A36/A36M; shop primed.
 - 3. Fasteners: Stainless steel.

2.03 DOOR

- A. Product: Insulgard Security 44/350 Wide Stile, Basis of Design or approved substitution.
- B. Description:
- 1. Factory fabricated door assembly constructed from either 6105-T5 or 6005-T5 extruded aluminum.
 - 2. Dimensions:
 - a. Stiles: 5 inches x 2 3/8 inches.
 - b. Top Rail: 4 1/2 inches x 2 3/8 inches.
 - c. Bottom Rail: Custom - 10 inches x 2-3/8 inches
 - d. Glazing Stops: 1 inch face.
- C. Performance Criteria:
- 1. Wind Loading: Interior - 5psf.
 - 2. Deflection Limits:
 - a. Deflection of any framing member in a direction normal to the plane of the wall when subjected to the indicated design loads shall not exceed l/175 of its clear span or 3/4 inch, whichever is less.
 - b. For cantilevers, the span shall be taken as two times the distance between anchor centerline and end of cantilever.
 - c. The deflection shall not exceed 50 percent of the nominal joint width at sealant joints occurring between framing members and adjacent materials, unless otherwise required by sealant manufacturer.
 - d. Upon reversal of load direction at magnitudes up to and including 1.5 times design pressures, slippage at fastened and/or clamped connections, shall not exceed 1/8 inch.
 - e. Glass deflection at full design load shall not exceed 1/100 of its span, or 3/4 inch, whichever is less.
- D. Ballistic Resistance:
- 1. Level 2 in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing and panels.
- E. Finish: Class I natural anodized.
- 1. Factory finish all surfaces that will be exposed in completed assemblies.
- F. Hardware
- 1. Door Hardware: See Section 08 71 00.

2.04 GLAZING

- A. Glazing Material: Laminated.
- 1. Ballistic Resistance: Level 2.
 - a. 1 inch MP1000 Lexgard Basis of Design or approved substitution.

2. Color: Clear.
- B. Glazing gaskets:
 1. Closed cell neoprene (40-50 Shore "A" Durometer).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- F. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members.
- B. Door corner joinery of extruded and keyed aluminum spline with a continuous 3/8 inch diameter steel tie rod at top and bottom rails.

3.04 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- D. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

**SECTION 08 56 53
SECURITY WINDOWS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Detention windows, with glazing.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. 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; 2024.
- D. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2008 (Reapproved 2019).
- E. UL (DIR) - Online Certifications Directory; Current Edition.
- F. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.
- C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
- D. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with at least 5 years experience in the manufacture of windows of the type specified.
- B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:
 - 1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Detention Windows:
 - 1. Trussbilt: www.trussbilt.com.

2. American Steel: www.amsteelpro.com.
 3. Architectural Openings: www.architecturalopeningsinc.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Security Glazing:
1. Sierracin Corporation: www.sierracin.com/#sle.
 2. North America Specialty Glass: www.naspecialtyglass.com/#sle.
 3. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASSEMBLIES

- A. Security and Detention Windows:
1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 01 60 00.
 2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
 3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
 4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
 5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
 6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
 7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 DETENTION WINDOWS WITH PAPER PASS SLOT

- A. Detention Windows: Factory-assembled fixed glazing frames reglazable from exterior without disassembly of frame; attach removable components with security fasteners that are not removable without the use of appropriate tools.
1. Detention Bars: None.
 2. Glazing: Laminated type with glass on both surfaces; type as required to achieve performance criteria specified.
 3. Speak Thru: Round 6" diameter cast stainless steel with natural voice transmission.
 4. Framing and Sash: Formed steel sheet perimeter framing, and glazing stops; primed for field finish.
 5. Forced Entry Resistance: ASTM F1233, Class III, tested from both sides.

2.04 ASSEMBLY COMPONENTS

- A. Formed Steel Framing: ASTM A1008/A1008M, Designation CS (commercial steel), cold-rolled steel sheet; 12 gauge, 0.1046 inch (2.66 mm) minimum thickness.
- B. Galvannealed Formed Steel Framing: ASTM A653/A653M galvannealed to A60/ZF180 coating; 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
- C. Rolled Steel Framing: ASTM A36/A36M steel shapes, plates, and bars.
- D. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
1. Provide minimum of three anchors per side of window plus one additional anchor for each 18 inches (457 mm) or fraction thereof more than 36 inches (915 mm) in height or width.

- E. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.
- F. Speaking Aperture Covers: Stainless steel, round, allowing passage of speech at normal volume without distortion; listed and labeled by UL (DIR) as bullet resisting to UL 752, same level as window.
- G. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch (0.76 mm) minimum thickness per coat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawing details.
- B. Install windows in correct orientation (inside/outside or secure/non-secure).
- C. Anchor windows securely in manner so as to achieve performance specified.
- D. Set sill members and sill flashing in continuous bead of sealant.
- E. Windows Not Factory-Glazed: Complete field painting before installation of glazing.

3.03 CLEANING

- A. Clean exposed surfaces promptly after installation without damaging finishes.
- B. Remove and replace defective work.

END OF SECTION

This page intentionally left blank

**SECTION 08 71 00
DOOR HARDWARE****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
 - 1. Commercial door hardware.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.

1.02 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include details of electrified door hardware and wiring diagrams.
- C. Samples: Samples of products included in submittals shall be supplied upon request for review.
- D. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, degree of opening, and finish of each door hardware item. Include description of each electrified door hardware function, wiring diagrams and sequence of operation.
- E. Keying Schedule: Detail Owner's final keying instructions for locks in the form of a schematic.

1.03 QUALITY ASSURANCE

- A. Supplier Qualifications:
 - 1. Person who is or employs a qualified DHI Architectural Hardware Consultant.
 - 2. Shall have supplied jobs of similar size and value.
 - 3. Shall be a factory authorized supplier of any products submitted.
 - 4. Shall have been in the business of supplying finish hardware for a minimum of five years.
- B. Source Limitations: Obtain electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
- C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule. Submit schematic to manufacturer at time of order.
- D. Pre-installation Conference: Conduct conference at Project site.
- E. Keys: All keys shall be labeled and copy of finalized schematic delivered to owner by registered mail. All keys shall be stamped in a manner the owner requests.
- F. Templates: Obtain and distribute templates for doors, frames, finish hardware and other work specified to be factory prepared for installing door hardware.
- G. Standards: Comply with BHMA A156 series standards, Grade 1, unless Grade 2 is indicated.
- H. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

1.04 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within warranty period.
 - 1. Warranty Period for Manual Closers: 10 years from date of Substantial Completion. Closer body shall carry a life of the building warranty.

PART 2 PRODUCTS**2.01 DOOR HARDWARE**

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.
- D. Shall comply with all code requirements.

2.02 PIVOTS AND HINGES

- A. Hinges:
 - 1. Manufacturers: Butt Hinges
 - a. Baldwin Hardware Corporation (BH).
 - b. HB Ives. An Allegion Security Group Company (IV).
 - c. McKinney Architectural Hardware. An ASSA Abloy group company. (MK).
 - 2. Butt hinges shall comply with ANSI 156.1, Grade 1.
 - a. Standard Weight Interior: TA2714 MK.
 - b. Standard Weight Exterior: TA2314 NRP SSF MK.
 - c. Heavy Weight Interior: T4A3786 MK.
 - d. Heavy Weight Exterior: T4A3386 NRP SSF MK.
 - 3. Continuous Hinges: Markar FM100.
 - 4. Manufacturers: Continuous Hinges
 - a. Pemko Manufacturing Company, An ASSA Abloy Group Company.
 - b. Select Products, Limited. SL3500
 - c. Stanley Hinge, A Stanley Security Group Company. 652HD UL
 - 5. General: Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units. Continuous hinges are to be pin and barrel, geared hinges will not be accepted. Base material is aluminum.
 - 6. Ball bearing or anti-friction bearing butt hinges shall be used on any door with a closer or overhead stop. Heavy weight hinges shall be used in accordance with manufacture's recommendations for door weight.
 - 7. Shall be full mortised unless indicated in hardware sets.
 - 8. Number of Hinges:
 - a. Butt Hinges: Two hinges for every door up to 60". One additional hinge for every additional 30" of door height.
 - 9. Hinge Size:
 - a. Butt Hinges: Shall meet manufactures requirements for size based on door weight and width.
 - 10. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - a. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - b. Interior Hinges: Steel, with steel pin.
 - c. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
 - 11. Non-removable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed; for outswinging exterior doors.
 - 12. Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.
 - a. Metal Doors and Frames: Machine screws (drilled and tapped holes).
 - b. Wood Doors and Frames: Wood screws.
 - c. Fire-Rated Wood Doors: Threaded-to-the-head wood screws.
 - 13. Pivot Sets: Shall meet or exceed ANSI #C07162.

14. Pivot Set: Model 147 626 (RF).
15. Intermediate Pivots: Shall meet or exceed ANSI # C07321.
16. Intermediate Pivot: Model M19 626 (RF).
17. Manufacturers: Pivots
 - a. DormaKaba. (DO).
 - b. HB Ives. An Allegion Security Group Company. (IV).
 - c. Rixson Firemark. An ASSA Abloy Security Group Company. (RF).

2.03 MECHANICAL LOCKS AND LATCHES

- A. Manufacturers:
 1. Accurate Lock & Hardware. 9000/9100 series. (AL).
 2. Corbin Russwin Architectural Hardware. An ASSA Abloy Group Company. ML2000 102T series (RU).
 3. Sargent Lock. An ASSA Abloy Group Company. 8200 MDO series. (SA).
- B. Lockset shall meet ANSI A156. 13, Grade 1.
- C. Lockset Design: 102T by Corbin Russwin (RU).
- D. Levers shall be solid cast or wrought, BHMA 630.
- E. Dummy Trim: Lever, trim and finish shall match lockset design.
- F. Latch bolts shall have a mechanical anti-friction latches. Plastic inserts will not be permitted.
- G. Lock Throw: Comply with labeled fire door requirements.
- H. Backset: 2-3/4 inches, unless otherwise indicated.

2.04 BOLTS

- A. Fire-Rated Doors: Comply with labeled fire door requirements.
- B. Surface Bolts: Flush bolt heads of minimum 1/2-inch- (12.7-mm-) diameter rods of brass, bronze, or stainless steel with minimum 12-inch- (305-mm-) long rod.
- C. Manufacturers:
 1. Door Controls International (DCI).
 2. McKinney Architectural Hardware. An ASSA Abloy Group Company. (MK).
 3. Rockwood Manufacturing. An ASSA Abloy Group Company (RM).
- D. Flush Bolts: BHMA Grade 1, designed for mortising into door edge.
 1. Manufacturers:
 - a. Door Controls International (DCI).
 - b. McKinney Architectural Hardware. An ASSA Abloy Group Company. (MK).
 - c. Rockwood Manufacturing. An ASSA Abloy Group Company (RM).

2.05 EXIT DEVICES

- A. Manufacturers:
 1. Corbin Russwin Architectural Hardware Inc. An ASSA Abloy Group Company. ED4000 series (RU).
 2. Von Duprin. An Allegion Security Group Company. 35 series. (VD).
 3. Sargent Lock. An ASSA Abloy Group Company. 80 series. (SA).
- B. Panic Exit Devices: Shall be listed and labeled for panic protection, based on testing according to UL 305.
- C. Fire Exit Devices: Shall complying with NFPA 80, listed and labeled for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- D. Shall meet ANSI A156.3, Grade 1.
- E. All latch bolts shall be deadlocking.
- F. All exposed metal shall be in BHMA 630. Aluminum anodized finish will not be accepted.

- G. Outside operating trim shall be through-bolted with concealed fasteners.
- H. Operating trim shall be freewheeling with clutch mechanism allowing lever to rotate 60 degrees when locked to prevent vandalism.
- I. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

2.06 OPERATING TRIM

- A. Push-Pull Design: As scheduled.
 - 1. Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Door Controls International. (DHI).
 - c. Rockwood Manufacturing. An ASSA Abloy Group Company. (RM).

2.07 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3.
 - 1. Carry-Open Bars: Where a coordinator is specified, provide carry-open bars for inactive leaves of pairs of doors.
- B. Manufacturers:
 - 1. Door Controls International (DCI).
 - 2. McKinney Architectural Hardware. An ASSA Abloy Group Company. (MK).
 - 3. Rockwood Manufacturing. An ASSA Abloy Group Company. (RM).

2.08 CLOSERS

- A. Shall be certified ANSI A156.4 Grade 1, non-handed.
- B. Surface-Mounted Closers:
 - 1. Shall have multi sized spring power adjustment for sizes 2 thru 6 or 1 thru 4 for barrier free applications.
 - 2. Shall have full covers.
 - 3. Rack and Pinion shall always have minimum two full gears engaged.
 - 4. Stop arms, where specified, shall be Unitrol type with spring stop and backcheck at 65 degrees.
 - 5. Provide soffit plate for parallel arm applications using aluminum frames with blade stops or snap on stops.
 - 6. Provide drop plates as required.
 - 7. Provide accessory bracket for the proper installation of door closers.
- C. Manufacturers:
 - 1. Corbin Russwin Architectural Hardware, Inc. An ASSA Abloy Group Company. DC6200 series (RU).
 - 2. Norton Door Controls. An ASSA Abloy Group Company. 7500 series. (NO).
 - 3. LCN Closers. An Allegion Security Group Company 4040XP series. (LC).
- D. Size of Units: Factory-sized, adjustable to meet field conditions and requirements for opening force.

2.09 PROTECTIVE TRIM UNITS

- A. Protective Trim Units: Sized 2 inches less than door width on push side and 1 inch less than door width on pull side, by height scheduled or indicated. Plates to be applied ½" from bottom of door to bottom of plate and centered on the door.
 - 1. Shall be beveled on three sides.
 - 2. Material: Metal.
 - a. Fasten to door using fasteners provided by manufacturer.
- B. Manufacturers:
 - 1. Baldwin Hardware Corporation (BH).
 - 2. Door Controls International. (DHI).
 - 3. Rockwood Manufacturing. An ASSA Abloy Group Company. (RM).

2.10 STOPS AND HOLDERS

- A. All doors shall have a doorstop that effectively protects any and all doors, walls and finish hardware that comes into contact with the operation of the function of the door. Wall stops are the preferred method.
- B. Provide sufficient blocking and reinforcement for secure installation and operation of all stops and holders.
- C. Overhead stops shall be provided where noted in hardware sets or if wall stop can not stop and protect the doors, walls or finish hardware from damage.
- D. Oversized floor stops are only permitted for exterior doors.
- E. Closer stop arms are only permitted if specified in hardware set.
- F. Manufacturers:
 - 1. Glynn Johnson. An Allegion Security Group Company. (IV).
 - 2. Rixson-Firemark, Inc. An ASSA Abloy Group Company. (RF).
 - 3. Rockwood Manufacturing. An ASSA Abloy Group Company. (RM).
- G. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

2.11 DOOR GASKETING AND THRESHOLDS

- A. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.
- B. Manufacturers:
 - 1. Gasketing:
 - a. McKinney Architectural Hardware. An ASSA Abloy Group Company. (MK).
 - b. National Guard Products. (NGP)
 - c. Pemko Manufacturing Co., Inc. An ASSA Abloy Group Company. (PEM).
- C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled, based on testing according to UL 1784.
- E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled, based on testing according to UL 10C or NFPA 252.
- F. Sound-Rated Gasketing: Assemblies that are listed and labeled, based on testing according to ASTM E 1408.
- G. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.
- H. Thresholds: Of type scheduled or indicated.
 - 1. Manufacturers:
 - a. McKinney Architectural Hardware. An ASSA Abloy Group Company. (MK).
 - b. National Guard Products. (NGP)
 - c. Pemko Manufacturing Co., An ASSA Abloy Group Company. Inc. (PEM).

2.12 SLIDING AND FOLDING DOOR HARDWARE

- A. Folding Door Hardware: Complete sets consisting of overhead rails, hangers, supports, bumpers, floor guides, and accessories indicated.
- B. Manufacturers:
 - 1. Cox, Arthur & Sons, Incorporated (ACS).
 - 2. Henderson, P. C. Inc.; Div. of Hepworth PLC (PCH).
 - 3. Johnson, L. E. Products, Inc. (LEJ).
 - 4. Lawrence Brothers, Inc. (LB).

- C. Interior Doors: Provide door hardware for interior bi-folding doors when not furnished as part of door package.
- D. Bi-folding Door Hardware: Rated for door panels weighing up to 50 lb (23 kg).
- E. Multiple Folding Door Hardware: Rated for door panels weighing up to 30 lb (14 kg).

2.13 CYLINDERS, KEYING, AND STRIKES

- A. Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturer of cylinders shall be the same as the lock manufacturer. Design is Corbin Russwin Access 3 High Security patented keyway.
 - 2. Number of Pins: Six.
 - 3. Interchangeable Cores: Manufacturer's standard; finish face to match lockset.
 - 4. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys with core only removal. Provide 10 construction master keys.
 - 5. Construction temporary cores must be returned, in good condition, to the hardware distributor.
 - 6. Final cores and keys must be delivered to the owner via priority US mail.
 - 7. Final cores shall not be installed before construction is completed. Owner shall be educated on installation of the cores by the general contractor.
 - 8. Cylinders shall be inscribed with concealed key control.
 - 9. Final Keys: Include 5 GM keys, 30 masterkeys, 4 control keys, 3 change keys per cylinder and 5 electrical, janitor and IT keys each. Additionally, provide 50 key blanks with side biting cut to match system.
- B. Keying System: Factory-registered keying system. All cylinders shall employ a patented locking mechanism the requires the use of a patented key and is furnished with a minimum of 6 pins.
Supply owner with proper key / cylinder ordering forms from manufacturer. Keys and cylinders may only be ordered through factory approved distributors that are in good standing with the DHI.
 - 1. Keys: Provide nickel-silver keys permanently inscribed with a visual key control number and "DO NOT DUPLICATE" notation. In addition to one extra blank key for each lock, provide three change keys and five master keys. Extra keys will only be available from manufacturer, through an authorized distributor with the proper permission forms from the building owner.
- C. Key Control System: Include key-holding hooks, labels, key tags with self-locking key holders, envelopes, and markers. Contain system in wall-mounted type metal cabinet with baked-enamel finish. Include cross-index system set up by key control manufacturer, with card index.
- D. Manufacturers:
 - 1. Key Control Systems, Inc. (KCS).
 - 2. Major Metalfab Co. (MM).
 - 3. Sargent Manufacturing Company. An ASSA Abloy Group Company. (SA).
 - 4. Sunroc Corporation (SUN).
- E. Strikes: Manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.

2.14 FABRICATION

- A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.
- B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.
- C. Spacers or Sex Bolts: For through bolting of hollow metal doors.
- D. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."
- E. Finishes: Comply with BHMA A156.18.

2.15 AUTOMATIC DOOR OPERATORS (HEAVY DUTY-LOW ENERGY)

- A. Owner's manual will be supplied as part of the close out documentation.
- B. Quality assurance
 - 1. Operator shall be manufactured by an AAADM registered manufacture. Manufactured to meet or exceed the American National Standard for Low Energy Power Operated Pedestrian Doors ANSI / BHMA 156.19.
- C. Source Limitations: Obtain automatic door operators and installation services through one source from a single manufacturer.
- D. Installer Qualifications
 - 1. Equipment must be installed by an AAADM Certified, record-USA factory trained and record-USA authorized company with a minimum of 5 years experience in the installation this the specified product type.
 - 2. Installing company of the equipment, to provide local central dispatch system for warranty service, this is to be available 24 hours a day, 365 days per year. A sticker will be placed in a prominent position on the header of each installed unit giving details of local service company, name and telephone number. If a SMART panel option is used, then details of the telephone number to be called will be programmed into the device.
- E. Warranty
 - 1. All automatic door components are warranted to be free of defects in materials or workmanship under normal use for a period of two years from the date of substantial completion.
- F. Manufacturer
 - 1. Norton Door Controls 6000 series.
 - 2. LCN 4600 series.
 - 3. Record-usa series 8100 Electromechanical Automatic Operator.
- G. Equipment
 - 1. The swing door operator consists of operator housing, swing power operator, electronic control, wire harnesses and connecting hardware.
 - 2. Automatic Swing Door Operator
 - a. Operator: Electro-mechanical operator, powered by 24 volt, 1/4 hp motor.
 - b. Operator is to be non-handed to ensure maximum versatility in adapting to varying field conditions. Opening Force shall be adjustable by means of one screw, to compensate for different manual push forces required on varying door widths.
 - c. The non-handed operator is completely contained in extruded aluminum housing. All aluminum sections are 6063-T5 alloy while the structural walls of the base plate have a minimum thickness of 0.187" (3/16") while the access cover (non-structural) has a minimum wall thickness of 0.094" (3/32"). The operator housing width by height shall not exceed 4-1/2" x 5". Length of operator housing determined by site conditions and/or specifications herein. Motor/gear box shall be secured to operator housing via tamper proof extruded channel on the back member of operator housing.
 - 3. Electronic Controls: Microprocessor controlled unit shall control the operation and switching of the swing power operator. The microprocessor control to provide low voltage power supply for all means of actuation. No external or auxiliary low voltage power source will be allowed. The controls include time delay for normal cycle.
 - 4. Connecting Hardware: Surface mounted operator is connected to the door by means of a steel door arm. The door arm is secured to the top rail of the swing door using one piece threaded tubular inserts for aluminum doors, 1/4-20 binding head and post screws (sex bolts) for wood and hollow metal doors. The standard power arm and connecting arm shall accommodate up to 12" reveals and opening angles to 120 degrees. The arm will be equipped with a mechanical device which will in the case of extreme force, "sheer" thus protecting any internal mechanical components from damage, in the case of abuse.
 - 5. Manual Use: The operator shall serve as a manual door closer in the direction of swing with or without electrical power.

6. External Control: A three position switch will be mounted in the end cover of the housing, along with a "fault warning" LED. The switch will be clearly marked, ON/OFF/HOLD OPEN. The LED will flash if the microprocessor detects a fault of any kind.
 7. Simplified Access: An access port that eliminates the need to remove the cover for service or adjustment is included as standard and located on the bottom of the unit unless specified elsewhere.
 8. Power Open: When an opening signal is received by the control unit, the door shall be opened at the operator-adjusted opening speed. Before the door is fully open at back check, it slows automatically to low speed. The motor stops when the selected door opening angle has been reached. The open position is held by the motor. If the door is obstructed while opening, it will either stop or reverse (field selectable).
 9. Field Adjustable Open Stop: The operator shall provide a field adjustable mechanical open stop to accommodate opening angles from 80 to 180 degrees.
 10. Normal Close: Closing shall be provided by means of spring; adjustable tension will be by means of a single screw.
 11. Power Close: Closing shall be provided by means of a spring and motor. When the hold open time has elapsed, the operator will close the door automatically, using spring force and motor. The door will slow to low speed at latch check before it reaches the fully closed position. The door is kept closed by spring power or extended closing force by the motor.
 12. Power Assist: Operator can be adjusted to lower the open forces when used manually. Power Assist will be active only while pushing or pulling the door and will allow the door to close when an opening force is no longer applied to the door.
 13. Electronic Dampening: Operator to include standard electric dampening system which automatically counteracts additional forces applied to the door during the opening or closing cycle by reducing door speed.
 14. Stack Pressure Feature: The electronic control allows for increases of forces to overcome stack pressure issues. The control automatically compensates for lower manual push forces when the door is used in manual mode. The door must comply with ANSI A156.19, when using this feature.
 15. Lock engage circuit: If locking is unsuccessful when the door reaches the closed position, the operator will automatically reverse open 10 degrees and reclose in an attempt to successfully lock the door.
 16. Test of Safety Sensors: If optional safety sensors are specified, the control will monitor the sensors before opening and closing the door. If sensors are not functioning correctly, automation is deactivated, and the door will function as a manual swing door with a door closer and a fault is registered in the controls log.
 17. Fire rated surface applied operators connect to the surface of an existing fire rated labelled door frame or wall. Connecting hardware and UL approved fire exit hardware is required. See UL materials directory.
 18. A separate contact will be provided that upon receipt of a signal from an external source (fire alarm), the unit will close if in an open condition and not operate as an automatic door, until the signal from the external source has been reset.
- H. Signage: Provide signage in accordance with ANSI/BHMA A156.19.
- I. Optional Features
1. M.A.R.T. panel LCD display: Will display the current status of the operator, any faults that the control sees and if required display a screen giving contact details for fault notification.
 2. Battery back-up: Accessibility and convenience at non-fire rated opening under power failure. The minimum size Uninterrupted Power Supply (UPS) should be rated at 1500VA.
- J. Push Plate Control Device
1. Actuation device is either:
 - a. Hard wired push plate switches. These will be either surface mounted with an appropriate enclosure or in a concealed single gang electrical box.
 - b. Radio controlled push plate switches.

- c. Touch less Activation sensor plates, 4 ½ inch square microwave technology, adjustable from 2" to 24."
- 2. Option: Suitable bollard for remotely mounting push plates in areas where no suitable mounting for existing methods of mounting the push plates exist.
- 3. Option: Push to Activate - is a programmable feature. Push or pull the door open from any position, and the door will gently power open, time out and slowly close.
- 4. Door can be used as a manual door with no damage to the operator.
- 5. Electrical Characteristics and Components
 - a. Power consumption must be less than or equal to the following: Nominal power 67 watts, Nominal current .08A at 120 VAC. Peak power consumption 2.9A, Standby .02A with power consumption of 13 watts.
 - b. OVERLOAD PROTECTION: Electric motor is equipped standard with a built-in thermal overload protection.
 - c. ELECTRICAL CONTRACTOR NOTE: provide two low voltage 18 gauge stranded wires from automatic operator to (50 feet max.) activation devices (if required).
- 6. ALUMINUM FINISHES
 - a. All exposed aluminum surfaces are dark bronze anodized (AAC23A44) or clear anodized (AAC22A31). Custom finishes such as stainless steel clad, powder coatings or paint are available, if specified (architect to provide color).
 - b. EXAMINATION
 - 1) Verify the openings are plumb and are dimensioned properly. Insure adequate support has been provided at the operator header. Proceed with the installation only after conditions are deemed satisfactory.
 - c. INSTALLATION AND ADJUSTMENT
 - 1) Install equipment in accordance with the manufacturers' installation instructions. Adjust equipment per instructions and current ANSI/BHMA 156.19 American National Standard for Power assist and low energy power operated doors.
 - 2) Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
 - 3) Controls: terminate wire to: controls, press plates, safety sensors.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- C. Wood Door Preparation: Comply with DHI A115-W series.
- D. Hardware Installation: Shall be in accordance to manufactures instructions.
- E. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- F. Miscellaneous Accessories: Shall be provided as necessary for the proper and secure attachment of all hardware to doors and frames.

- G. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and tap units that are not factory prepared for fasteners. Space fasteners and anchors according to industry standards.
 - 1. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- H. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.
 - 1. Door Closers Adjustments:
 - a. Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
 - b. Adjust back-check to slow the door opening at about 75 degrees, when door is forcibly opened beyond its pre-adjusted limits.

3.02 DOOR HARDWARE SETS

**SECTION 08 71 63
DETENTION DOOR HARDWARE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Detention door hardware.

1.02 REFERENCE STANDARDS

- A. ASTM F1577 – 05(2012), Standard Test Methods for Detention Locks for Swinging Doors.
- B. ASTM F1758 – 05(2012), Test Methods for Detention Hinges Used on Detention-Grade Swinging Doors.
- C. ITS (DIR) - Directory of Listed Products; Current Edition.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- H. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.
- I. UL 1034 - Standard for Burglary-Resistant Electric Locking Mechanisms; 2015.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Hardware Schedule:
 - 1. Submit typewritten schedule in the vertical format and separate openings by door size, hand, and fire rating.
 - 2. Indicate manufacturer's name, product type, style, function, size, locations, and finish of each hardware item.
 - 3. Establish a list explaining the abbreviations and symbols utilized.
 - 4. Generate a door index with door numbers and corresponding hardware sets.
 - 5. Use same reference designation indicated on contract drawings.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
 - 2. Bitting List: List of combinations as furnished.
- F. Keying Schedule:
 - 1. Submit a project specific detention lock keying schedule and a corresponding schematic flow chart that parallels the established keying.
 - 2. Organize a detention keying meeting with the Architect and Owner to discuss and review the established keying in order to avoid delay in the completion and delivery of the required detention hardware.
 - 3. Provide a final schedule based on the approved keying requirements.
- G. Wiring Diagrams:
 - 1. Submit point-to-point wiring diagrams for electrified hardware items two (2) weeks after receiving approved hardware schedule.

- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.
- J. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- K. Operation and Maintenance Manuals
 - 1. Furnish three (3) copies in accordance with Division I General Requirements including the following information.
 - a. Three ring binder with separating tabs.
 - b. List of manufacturers and distributors of each hardware item including; name, address, contact, phone and fax numbers, and email addresses.
 - c. Product data sheets, templates, wiring diagrams, and product guarantees.
 - d. Operation and maintenance instructions and installation instructions with complete parts lists for each hardware item.
 - e. Final as-built copy of the detention hardware and keying schedule.

1.04 MAINTENANCE MATERIALS

- A. Furnish the Owner with the following quantities of hardware items utilized on the project as spare parts for maintenance:
 - 1. Hinges: Six (6) of each type and size used.
 - 2. Electric Hinge: One (1) of each type used.
 - 3. Door Position Switch (DPS): Two (2) of each type used.
 - 4. Closer: Two (2) of each type used.
 - 5. Pulls: Two (2) of each type used.
 - 6. Stops: Five (5) of each type used.
 - 7. Bolt Position Switch (BPS): One (1) of each type used.
 - 8. Limit Switches: Five (5) of each type used.
- B. Extra Fasteners
 - 1. Furnish fifty (50) of each type, size, and finish used to install detention hardware.
 - 2. Furnish three (3) special driver tools and six bits for each different size screw, including special adjustment tool for door closers.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years of documented experience.
 - 1. Provide a list of ten (10) projects that have been complete and operational for a minimum of five (5) years and three (3) projects currently in fabrication. For each facility, list the name and location of installation, value of contract, scope of work provided, date of occupancy by Owner, Owner's representative to contact and telephone number, Construction Manager or General Contractor, and Architect. Indicate length of delivery after receipt of approved submittals.
 - 2. The manufacturer shall be actively engaged in the design and manufacturing of detention locks, locking devices and miscellaneous detention hardware. All locks, locking devices and related detention hardware shall be manufactured and supplied by the same manufacturer.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least five years of documented experience.
 - 1. Provide a letter of qualification that lists references for projects completed and occupied within the past three (3) years. Include qualification statements and current audited financial statement indicating capability to fulfill contractual obligations.
- C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.
- D. Welder Qualifications:

1. Welders employed for this project shall be qualified in accordance with the American Welding Society (AWS) B2.1-84 or D1.1-96 test procedures and have passed qualification tests current within the past twelve (12) months.
 - a. Welding Standards:
 - 1) AWS D1.1-98, "Structural Welding Code-Steel."
 - 2) AWS D1.3-89, "Structural Welding Code-Sheet Steel."
 - 3) AWS D9.1-90, "Sheet Metal Welding Code."
 - 4) AWS B2.1-84, "Welding, Procedures and Performance Qualifications."
 2. Contractor shall require any welder to re-take qualification test when, in the opinion of the Architect, the welder's work creates a reasonable doubt as to the proficiency of the welder. Re-taking of qualification tests shall be conducted at no additional expense to the Owner. Evidence of recertification shall be submitted to Architect after welder in question has passed qualification test.
- E. Regulatory Requirements:
1. Comply with requirements of NFPA 80, "Standard for Fire Doors and Windows" and NFPA 101, "Life Safety Code," current editions, in providing hardware for fire rated openings.
 2. Comply with the Americans with Disabilities Act (ADA), 28-CFR Part 36, Appendix A, "Accessibility Guidelines for Buildings and Facilities" for hardware required to be accessible to the physically disabled.
 3. Comply with UL 1034-87 "Burglary Resistant Electric Locking Mechanisms", for electric locking mechanisms and related devices.
 4. Comply with UL 437-86 "Key Locks", for key cylinders.
 5. Comply with ASTM F1758-96 "Test Methods for Detention Hinges Used on Detention-Grade Swinging Doors", for performance level specified.
 6. Comply with ASTM F1577-96 "Test Methods for Detention Locks for Swinging Doors", for performance level specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.
1. Packaging shall be marked with hardware set numbers and door numbers corresponding with final reviewed hardware schedule identifying correct locations for installation.
 2. Include manufacturer's printed installation instructions, fasteners and installation tools.
 3. Ship in cartons marked "DETENTION HARDWARE" for identification at job site.
- B. Inventory hardware upon delivery to determine shortages and items on backorder in relation to the final reviewed hardware schedule.
- C. 2. Return damaged and incorrect hardware items for replacement so that the completion of work will not be delayed by hardware losses, both before and after installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warranty against defects in material and workmanship for period of one (1) year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hinges: R. R. Brink, Southern Folger, Northwest Specialty.
- B. Detention Locks: R. R. Brink, Southern Folger.
- C. Institutional Locks: R. R. Brink, Southern Folger.
- D. Door Pulls: R. R. Brink, Southern Folger, Northwest Specialty
- E. Escutcheons: R. R. Brink, Southern Folger
- F. Door Position Switches: R. R. Brink, Southern Folger

- G. Door Closers: LCN
- H. Door Stops: Northwest Specialty, Ives
- I. Bolt Position Switches: R. R. Brink, Southern Folger
- J. Key Cabinet: Telkee
- K. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Applicable provisions of NFPA 101.
 - 3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 4. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - 5. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified.
- D. Electrically Operated or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
 - 1. See Section 28 10 00 for additional access control system requirements.
- E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Shop Drawing submittal of Door Hardware Schedule.

2.03 HARDWARE

- A. Screws and Fasteners.
 - 1. Furnish screws and fasteners in accordance with manufacturers' instructions and recommendations and have exposed fasteners match the hardware item.
 - 2. Provide security torx-head fasteners (star design with center pin) for exposed fasteners on all detention hardware, regardless of manufacturer.
- B. Hinges.
 - 1. Northwest Institutional Full Mortise Security Stud Hinge
 - a. Material:
 - 1) Full mortised 4-1/2" x 4-1/2" x 3/16" cast stainless steel leaves with integral anti-shear security stud and hospital tip.
 - 2) Welded in-place stainless steel non-removable pin construction with anti-friction bearings.
 - b. Performance:
 - 1) Use with conventional sized security hollow metal doors.
 - 2) UL listed fire door hinge.
 - c. Options:
 - 1) Electric power transfer available with wire versions 2, 4, or 8; specify ETW (Electric Through-wire).
 - d. Brink #3FP Food Pass Hinge:
 - 1) Material:
 - (a) Cold rolled steel with welded in-place pin and primed for paint.
 - (b) Full surface 3" x 4" x 1/4" bolt-on leaves; drilled and countersunk.
 - 2) Performance:

- (a) Bolt-on stop added that limits shutter opening rotation to a horizontal position to form a shelf.

C. Detention Locks.

1. Security latch for food pass: Brink 7017 Series

a. Material:

- 1) Investment cast steel lock case and cover, zinc plated for resistance to corrosion.
- 2) Stainless steel 1-1/2" x 3/4" latch bolt with 1/4" retracted projection, 1/2" throw.
- 3) Six hard brass lever tumblers with heavy bronze tumbler springs and 'anti-pick' notches for both locked and unlocked condition.
- 4) Investment cast, bronze alloy, one-piece paracentric key cylinder.

b. Performance:

- 1) Key operated latch. Key removable in latched position.

c. Options:

- 1) Brink 7017M latch utilizes the same lock case as the 7017 but is fitted with a mogul key cylinder.

2. Electro-Mechanical Automatic Deadlocking Jamb Latch: Brink 5020M

a. Material:

- 1) Lock case and cover of 10 gauge steel and electroplated for corrosion resistance with cast stainless steel strike plate and working parts of copper alloy or stainless steel.
- 2) Beveled latch made of saw-resistant hardened steel with a full 1" throw and 3/4" x 1-1/2" cross section.
- 3) Provide a 2" mogul cylinder housing with internal parts (i.e. pins, springs, balls, cylinder plug) and mogul key that are larger than and not similar to standard mortise type cylinders and keys; keyed one-side is 5022M and two-side are 5026M.

b. Performance:

- 1) Lock shall comply with UL10B Fire Tests of Door Assemblies; Class A - 3 hour rating and UL-1034 Burglary Resistant Electric Locking Mechanism.
- 2) Lock shall comply with the impact test criteria for Security Grade 2 as set forth in ASTM Standards F1450 and F1577.
- 3) Fail secure lock operation has internal switches that monitor status of bolt to show deadlocked and unlocked conditions.
- 4) Lock Status Switch (LSS) trips when latch is in deadlocked condition. Used in a signal circuit to indicate lock status – unlocked or deadlocked - via control panel lights and/or alarm devices; connected in combination with a door position switch to give positive indication that a door is in both the closed and locked position.
 - (a) LSS is also used to control an electrical interlock, which permits only one of a group of doors to be unlocked at any time.
- 5) Manual key unlocking and electric unlocking by either 24 VDC or 120 VAC gearmotor.

c. Options:

1) Functions:

(a) MCLH-M - Momentary Contact Latch Holdback-Mechanical

- (1) Electric - With momentary depression of lock control button at the control panel, the motor will revolve full-cycle causing the latch to retract (unlock). The latch is then held mechanically in the retracted position (without power) until the door is opened, at which time the latch will extend mechanically and door may be slam-locked. Once the lock control button is depressed, the door must be opened for the latch to extend and lock to reset.
- (2) Mechanical - When the latch is retracted manually by key, the latch is held mechanically retracted until the door is opened, at which time the lock will reset mechanically for slam-locking.

2) Factory supplied high security mortise key cylinder.

- 3) Factory fitted Key Cylinder Extender (KCE) – In lieu of a conventional stop (push) side key cylinder access opening in the frame, a key cylinder extension extends the working length of a standard mortise or mogul key cylinder to adapt to outside jamb depths; applies to one side stop of both side keying only.
- 4) Controlled Key Switch (CKS) – Factory key cylinder modification and an internal limit switch produce a key switch feature which electrically actuates the lock by one way only rotation of the change level key. This feature can be rendered inoperative by switch from a remote control panel. Mechanical unlocking is by a master level key. This feature is indicated when it is desirable to restrict periods when key unlocking is possible, e.g. building access or prison inmates who carry a key to their cell.

D. Closers

1. All door closers shall be one manufacturer to provide for proper installation and servicing after installation.
2. All closers to be cast iron with forged steel arm.
3. All closers shall utilize all-weather type hydraulic fluid capable of withstanding temperature ranges of 120 degrees F. to -30 degrees F. without seasonal adjustment.
4. All closers on exterior doors to have a powder coat finish on closer body.
 - a. SRI primer required for installation in corrosive conditions.
5. Provide concealed overhead closers in inmate areas and surface mounted closers in public and administrative areas where scheduled.
6. Surface Mounted Door Closers: LCN
 - a. Heavy duty door closers shall be utilized on non-secure openings and mounted on the room side away from the corridor.
 - b. Regular Arm and Parallel Arm– 4040
7. High security door closers shall be utilized on secure openings and mounted on the side away from inmate access, otherwise outside of corridors.
 - a. Regular Arm – 4510
 - b. Parallel Arm – 4210
8. Concealed Overhead Door Closer: LCN 2210
 - a. Provide optional SPDT door position switch with removable finish plates to gain access for field adjustments.
 - b. Include two (2) test kits with the DPS option.

E. Door Trim

1. Raised Pull: Brink 300021
 - a. Material: Cast brass with satin chrome finish.
 - b. Size: 8-3/4" L x 1-3/4" W x 2-1/4" projection.
2. Flush Pull: Brink 300011-C
 - a. Material: Cast brass with satin chrome finish.
 - b. Size: 5" L x 4" W x 1" D.
3. Knob Pull: Brink 300012
 - a. Material: Solid brass with satin chrome finish.

F. Door Stop

1. Northwest Specialty NW 606
 - a. Material: Silicone rubber body, threaded steel shank.
 - b. Size: 2" diameter x 3-1/2" long bumper, 5/8" diameter x 2-1/2" long shank.
 - c. Wall or floor mounted.
 - d. Options
 - 1) IVES; specify FS18, (S) Short, (L) Long.

G. Door Silencers

1. Rockwood 608.

H. Door Position Switches

1. Mortise Mounted Magnetic DPS: Brink 201020
 - a. Material:
 - 1) Die cast zinc magnet and switch body.
 - 2) Magnet is mortise mounted into the door edge (preferably the top edge near the lock stile) and the reed switch unit which is mortised into the door frame opposite and on the same centerlines as the magnet.
 - b. Performance:
 - 1) Standard Function: DPS is actuated mechanically by movement of the door with a 2'-8" wide or narrower door, the switch will trip when the leading edge of the door is within 3/4" of the door stop.
 - 2) Magnet and reed switch units must align when the door is closed and the gap between the two units must not exceed 1/4".
 - 3) Wire in combination with a lock bolt status switch (LSS) to provide a reliable, tamper resistant control panel monitor (e.g., closed and deadlocked green light) and/ or interlock circuit.
 - c. Options:
 - 1) Triple-Biased design employing three (3) reed switches connected in series that are actuated by three (3) magnets in a matched pair configuration, specify 201023.

2.04 KEYING

- A. Provide three (3) separate keying systems; one (1) for paracentric key cylinders, one (1) for mogul key cylinders, and one (1) for builder's hardware cylinders, if applicable. Cylinders shall comply with UL437 and be labeled by a nationally recognized independent testing laboratory.
- B. Lever tumbler locks shall be keyed alike or different as directed. Provide no less than three (3) and not greater than ten (10) cut keys per key code.
- C. Mogul cylinder locks shall be keyed alike or different and master keyed as directed. Provide no less than three (3) and not greater than ten (10) cut keys per key code.
- D. Builders cylinder locks shall be keyed alike or different and master keyed as directed. Provide no less than three (3) and not greater than ten (10) cut keys per key code.
- E. Each key shall be stamped for identification corresponding to the approved hardware and final keying schedule. Deliver all keys directly from the manufacturer to the authorized Owner's representative in one shipment by secure carrier (hand carrier or registered mail).

2.05 KEY CONTROL

- A. Provide one (1) surface mounted key cabinet with continuous piano-type hinge and equipped with a pin tumbler lock that is capable of accommodating the number of keys required for this project, including at least twenty-five (25) standard builder's cylinder keys. Cabinet shall be designed to store keys with larger than standard bows without overlapping or tangling and be supplied with key control system including permanent key tags, temporary key tags, key gathering envelopes, signature receipt forms, hook label strips, instruction booklet, and visible index binder.
 1. Telkee Model TBH.

2.06 FINISHES

- A. The hardware finishes are to be industry standard as recognized and established by ANSI/BHMA A156.18, 'Materials and Finishes'.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect project site to determine flooring, walls, and ceiling are complete and cleaned in areas with detention hardware applications.
- B. Verify frames are installed plumb, square, and true and ensure the door operates smoothly without bind.
- C. Examine doors and frames for proper hardware preparations and correct door handing.

- D. Installation should not begin until unsatisfactory conditions have been corrected.
- E. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions, recommendations, templates, and applicable codes.
- B. All hardware shall be installed by technicians who are factory trained and certified in the installation of detention hardware.
- C. Install surface mounted door closers on the room side of openings, out of the corridor and public view using security torx screws.
- D. Install wall stops at the height of the lever location and floor stops six inches away from the wall at the hinge jamb allowing for the maximum degree opening for doors.
- E. Set exterior thresholds in a bed of sealant to completely fill concealed voids and exclude moisture from every source and remove excess sealant, but do not plug drain holes or block weeps.
- F. After installation, provide instruction sheets and installation details to the Owner with project close-out documents.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.
- B. Verify that hardware is installed in accordance with the approved detention hardware and keying schedules.
- C. Check hardware for proper placement, application, and operation.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- D. Wherever hardware is installed more than one (1) month prior to building acceptance or occupancy of a space or area, the installer shall return to the work during the month prior to acceptance or occupancy and make final check and adjustment of all hardware items.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.

3.06 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

3.07 DETENTION HARDWARE SCHEDULE**Detention Hardware Set DH-1:**

Doors: 222, 223, 224, 225

3 ea	Hinge	NW 645FMST	630	Northwest
1 ea	Electro-Mech Deadlatch	5022M x MCLH-M	GLV	R.R. Brink
1 ea	Raised Pull	300021	626	R.R. Brink
1 ea	Flush Pull	300011-C	626	R.R. Brink
1 ea	Stop	FS18S	RUB	IVES
3 ea	Silencer	608	RUB	Rockwood
1 ea	Door Position Switch	201023	603	R.R. Brink

Detention Hardware Set DH-2:

Doors: 220A, 220B, 226

3 ea	Hinge	NW 645FMST	630	Northwest
1 ea	Electro-Mech Deadlatch	5026M x MCLH-M	GLV	R.R. Brink
1 ea	Raised Pull	300021	626	R.R. Brink
1 ea	Flush Pull	300011-C	626	R.R. Brink
1 ea	Closer	2215/DPS	689	LCN
3 ea	Silencer	608	RUB	Rockwood

END OF SECTION

This page intentionally left blank

**SECTION 08 80 00
GLAZING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021.
- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- L. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2008 (Reapproved 2019).
- M. GANA (SM) - GANA Sealant Manual; 2008.
- N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.
- O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).
- P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 24 by 24 inch (___ by ___ mm) in size of glass units.
- E. Samples: Submit 12 inch (___ mm) long bead of glazing sealant, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.

- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Insulating Glass Certification Council (IGCC).
 - b. Safety Glazing Certification Council (SGCC).
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
 - 1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

1.07 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries; ____: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC; ____: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc; ____: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America; ____: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass); ____: www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Laminated Glass Manufacturers:
 - 1. Cardinal Glass Industries; ____: www.cardinalcorp.com/#sle.
 - 2. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
 - 3. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; ____: www.viracon.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Mirrored Glass Manufacturers:
 - 1. Glasswerks; Mirrored Glass: glasswerks.com/#sle.

2. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
 3. Saint Gobain North America; Saint Gobain Miralite Revolution: www.saint-gobain.com/#sle.
- D. Plastic Films Manufacturers:
1. 3M Window Film; _____:
solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
 2. Avery Dennison; Decorative Plastic Films: www.averydennison.com/#sle.
 3. Flexvue Films; _____: www.flexvuefilms.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria.
 6. Patterned Glass Type: ASTM C1036, Type II - Patterned Flat Glass, Quality - Q5, Form 3 - Patterned glass, with color and performance characteristics as indicated.
 7. Safety Wired Glass Type: ASTM C1036, Type II - Wired Flat Glass, Quality - Q5, complying with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II impact test requirements, and with color and performance characteristics as indicated.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
1. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
 2. Pilkington North America Inc; _____: www.pilkington.com/na/#sle. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
 3. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.

- B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Warm-Edge Spacers: Low-conductivity thermoplastic with desiccant warm-edge technology design.
 - a. Spacer Width: As required for specified insulating glass unit.
 - b. Spacer Height: Manufacturer's standard.
 - 4. Spacer Color: Black.
 - 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 - 6. Purge interpane space with dry air, hermetically sealed.
 - 7. Pre-Equalized Insulated Glazing Units: Provide glazing units sealed at manufacturing plant with internal pressure matching pressure of the installation location.
- D. Type IGU-01 - Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Gray.
 - b. Coating: Self-cleaning type, on #1 surface.
 - c. Coating: Low-E (passive type), on #2 surface.
 - 4. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - 5. Total Thickness: 1 inch (25.4 mm).
 - 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.28, nominal.
 - 7. Visible Light Transmittance (VLT): 32 percent, nominal.
 - 8. Solar Heat Gain Coefficient (SHGC): 0.19, nominal.
 - 9. Visible Light Reflectance, Outside: 7 percent, nominal.
- E. Type IGU-02 - Insulating Glass Units: Spandrel glazing.
 - 1. Applications: Exterior spandrel glazing unless otherwise indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 - 4. Inboard Lite: Heat-strengthened float glass, 1/4 inch (6.4 mm) thick.
 - a. Tint: Clear.
 - 5. Total Thickness: 1 inch (25.4 mm).
 - 6. Thermal Transmittance (U-Value), Summer - Center of Glass: _____, nominal.
 - 7. Visible Light Reflectance, Outside: _____ percent, _____.
- F. Type IGU-01* - Insulating Glass Units: Safety glazing.
 - 1. Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 - 2. Space between lites filled with air.

3. Glass Type: Same as Type IGU-01 except use fully tempered float glass for both outboard and inboard lites.
- G. Type TGU-1 - Translucent Glazing Units:
1. Applications: As indicated on drawings..
 2. Space between lites filled with honeycomb transparent insulation core aligned perpendicular to glazing, filled with Aerogel..
 3. Outboard Lite: Fully tempered float glass, 0.23622 inch (____ mm) thick, minimum.
 - a. Tint: Clear.
 4. Metal edge spacer; Continuous perimeter bar separated from glass surfaces with foam thermal break; Glass connected to spacers using structural silicon.
 5. Inboard Lite: Fully tempered float glass, 0.23622 inch (____ mm) thick, minimum.
 - a. Tint: Clear.
 6. Sound Transmission Class (STC) rating of 35, with special acoustical spacer and edge seal.
 7. Total Thickness: 1 inch (25.4 mm).
 8. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.20, nominal.
 9. Visible Light Transmittance (VLT): 32 percent, nominal.
 10. Solar Heat Gain Coefficient (SHGC): 0.29, nominal.
 11. Visible Light Reflectance, Outside: 31 percent, nominal.
 12. Glazing Method: Wet glazing method, sealant and sealant.
 13. Manufacturers:
 - a. Advanced Glazings, LTD: Solera; S-R5+Aerogel: <https://advancedglazings.com/#sle>.
 - b. ?
 - c. ?
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 GLAZING UNITS

- A. Type FG-1 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Heat-strengthened float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.
- B. Type FG-1* - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Sliding glass doors.
 - c. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - d. Other locations required by applicable federal, state, and local codes and regulations.
 - e. Other locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.
- C. Type SG-1 - Security Glazing: Laminated glass, 2-Ply.
1. Applications: Locations as indicated on drawings.
 2. Tint: Mirrored..
 3. Tint: Clear.
 4. Thickness: As required to meet performance criteria.
 5. Outer Lite: Tempered glass.
 6. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 7. Inside Lite: Heat-strengthened glass.
 8. Performance Criteria:
 - a. Bullet Resistance: Pass ASTM F1233 tests in compliance with ballistic criteria class and weapon description indicated; Class HG4 - Handgun-High.

- D. Type SG-2 - Security Glazing: Laminated glass, 2-Ply.
 - 1. Applications: All Doors located in sally port and inmate secure areas.
 - 2. Thickness: As required to meet performance criteria.
 - 3. Outer Lite: Tempered glass.
 - 4. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 5. Interlayer, Inboard Side : Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 6. Inside Lite: Tempered glass.
 - 7. Performance Criteria:
 - a. Forced Entry Resistance: Pass ASTM F1233 tests in compliance with Forced Entry Sequence of Testing, Class Achieved 1.2: 1-1/2 inch (4 cm) Diameter Pipe/Sledge, 25 impacts.
- E. Type SG-WT - Safety Wired Glass: Flat glass with embedded wire mesh.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Form: Form 1 - Wired glass, polished both sides; ASTM C1036.
 - 3. Mesh: M1 - Diamond; ASTM C1036.
 - 4. Tint: Clear, Class 1.
 - 5. Glass Type: Laminated annealed.
 - 6. Thickness: 1/4 inch (6.4 mm), nominal.
- F. Type M-1 - Transparent One-Way Mirror: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Thickness: 1/4 inch (6 mm).
 - 3. Glass Tint: Grey.
 - 4. Glass Type: Insulating glass unit.
 - 5. Lighting Ratio: Maintain at least 8:1 lighting level ratio between coated side (bright-observed side) and uncoated side (dim-observer side).
 - 6. Glazing Method: Gasket glazing.
 - 7. Manufacturers:
 - a. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 GLAZING COMPOUNDS

- A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - WET GLAZING METHOD (SEALANT AND SEALANT)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Place setting blocks at 1/4 points and install glazing pane or unit.
- C. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch (610 mm) intervals, 1/4 inch (6.4 mm) below sight line.
- D. Fill gaps between glazing and stops with _____ type sealant to depth of bite on glazing, but not more than 3/8 inch (9 mm) below sight line to ensure full contact with glazing and continue the air and vapor seal.
- E. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 INSTALLATION - STRUCTURAL SILICONE GLAZING

- A. Application - Factory (Shop) Glazed: Follow basic guidelines of structural silicone glazing for glazing application.
- B. Provide design review of the glazing system and project details, adhesion testing, proper surface preparation, training and a quality service program.
- C. Provide only structural silicone sealant, tested and manufactured for structural glazing.

3.07 INSTALLATION - PLASTIC FILM

- A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- B. Place without air bubbles, creases or visible distortion.
- C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.08 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.09 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.

- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.10 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

**SECTION 08 88 00
SPECIAL FUNCTION GLAZING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Laminated security glazing units.
- B. Insulating security glazing units.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021.
- 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; 2010.
- I. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2008 (Reapproved 2019).
- J. ASTM F1642/F1642M - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings; 2017.
- K. ASTM F2248 - Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass; 2012.
- L. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.
- M. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).
- N. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each affected installer.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling, and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, and special application requirements. Identify available colors.
- D. Samples: Two _____, 24 by 24 inches (____ by ____ mm) in size.
- E. Samples: One bead of glazing sealant, 24 inch (____ mm) in size, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. Fabricator's qualification statement.
- I. Installer's qualification statement.

- J. Executed warranty.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.
 - 2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
 - 1. Provide certified glass products through ANSI-accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Insulating Glass Certification Council (IGCC).
 - b. Safety Glazing Certification Council (SGCC).
- B. Fabricator Qualifications: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.
 - 1. Provide company, field supervisors, and installers with active ANSI-accredited certifications in appropriate categories for work specified.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide mock-up of glazing assemblies including glass and air barrier and vapor retarder seal.
- C. Locate as indicated by Architect.

1.07 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide 5-year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide 5-year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.
- D. Heat-Soaked Tempered Glass: Provide 5-year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Fabricators:
- B. Float Glass Manufacturers:
 - 1. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
 - 2. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
 - 3. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Security Glass Manufacturers:
 - 1. _____.
 - 2. _____.
 - 3. _____.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure.
 - 1. Coordinate with weather-barrier-related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties in accordance with manufacturer's published data as determined by the following procedures:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Comply with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Comply with ASTM C1048.
 - 4. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 - 5. Impact Resistant Safety Glass: Comply with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.

2.04 INSULATING SECURITY GLAZING UNITS

- A. Insulating Glass Units:
 - 1. Durability: Certified by independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic or magnetic sputter vapor deposition coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Black.
 - 4. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal between spacer and glass panes, and polysulfide, polyurethane, or silicone sealant as secondary seal around perimeter.
 - b. Color: Black.
 - 5. Purge interpane space with dry air, hermetically sealed.
- B. Type ISG-1 - Insulated Security Glazing: Laminated.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: As indicated on drawings..
 - 4. Laminated Inboard Lite, Outer Pane: Fully tempered float glass, 1/4 inch (6.4 mm) thick, min..
 - a. Tint: Clear.

5. Interlayer: Polyvinyl butyral (PVB); thickness as required to achieve specified performance requirements.
 6. Laminated Inboard Lite, Inner Pane: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 7. Total Thickness: 1 inch (25.4 mm).
 8. Performance Requirements:
 - a. Explosion Resistance: Pass ASTM F1642/F1642M tests and ASTM F2248 practice requirements for Condition 1 - Safe Protection Level, Hazard Level-None.
 9. Thermal Transmittance (U-value), As defined on Code Summary as a minimum: _____, _____.
 10. Visible Light Transmittance (VLT): As defined on Code Summary as a minimum percent, nominal.
 11. Solar Heat Gain Coefficient (SHGC): As defined on Code Summary as a minimum, nominal.
 12. Visible Light Reflectance, Outside: As defined on Code Summary as a minimum percent, nominal.
- C. Type ISG-2 - Insulated Security Glazing: Laminated.
1. Applications: Locations as indicated on drawings.
 2. Space between lites filled with air.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 4. Warm-edge spacer.
 5. Laminated Inboard Lite, Outer Pane: Fully tempered float glass, 1/4 inch (6.4 mm) thick, min..
 6. Interlayer: Polyvinyl butyral (PVB); thickness as required to achieve specified performance requirements.
 7. Laminated Inboard Lite, Inner Pane: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 8. Performance Requirements:
 - a. Bullet Resistance: Pass ASTM F1233 tests to comply with Class R5 - Rifle-Jacketed ballistic criteria and weapon description.
 9. Visible Light Transmittance (VLT): As defined on Code Summary as a minimum percent, nominal.
 10. Solar Heat Gain Coefficient (SHGC): As defined on Code Summary as a minimum, nominal.
 11. Visible Light Reflectance, Outside: As defined on Code Summary as a minimum percent, nominal.

END OF SECTION

**SECTION 08 88 13
FIRE-RATED GLAZING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire-rated glazing units.
- B. Glazing compounds.

1.02 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 E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.
- G. UL (DIR) - Online Certifications Directory; Current Edition.
- H. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- J. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Two samples 24 by 24 inch (____ by ____ mm) in size of glass units.
- E. Samples: Two samples of 12 inch (____ mm) long bead of glazing sealant, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Specimen warranty.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.
 - 2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

1.07 FIELD CONDITIONS

- A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty for Insulating Glass Units: Provide 5-year manufacturer warranty coverage for seal failure, interpane dusting or misting, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
- C. Manufacturer Warranty for Laminated Glass: Provide 5-year manufacturer warranty coverage for delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 GLASS MATERIALS****2.02 GLAZING UNITS**

- A. Type FRG-1 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flames, smoke, and blocks radiant heat, as required to achieve indicated fire rating period exceeding 45 minutes.
 - 1. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
 - c. Other locations as indicated on drawings.
 - 2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 - 3. Safety Glazing Certification: 16 CFR 1201 Category II.
 - 4. Fire Rating Period: As indicated on drawings.
 - 5. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
 - a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
 - b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "T" - meets temperature rise of not more than 450 degrees F (250 degrees C) above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
 - e. "XXX" - placeholder that represents fire rating period, in minutes.
 - 6. Products:
 - a. McGrory Glass, Inc; AGC Pyrobel Series ____: www.mcgrory.com/#sle.
 - b. SAFTIFIRST, a division of O'Keeffe's Inc; ____: www.safti.com/#sle.
 - c. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GLAZING COMPOUNDS

- A. Type GC-1 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.
1. Manufacturers:
- a. BASF Corporation; _____: www.basf.com/#sle.
 - b. Bostik Inc; _____: www.bostik-us.com/#sle.
 - c. Dow Corning Corporation; _____: www.dowcorning.com/construction/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; _____: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

END OF SECTION

This page intentionally left blank

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
- B. Preparation of new concrete floor slabs for installation of floor coverings.
- C. Testing of concrete floor slabs for alkalinity (pH).
- D. Remediation of concrete floor slabs due to unsatisfactory alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- E. Patching compound.
- F. Remedial floor coatings.

1.02 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 2020.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.04 SUBMITTALS

- A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- B. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Copies of specified test methods.
 - 4. Recommendations for remediation of unsatisfactory surfaces.
 - 5. Submit report to Architect.
 - 6. Submit report not more than two business days after conclusion of testing.
- C. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

- A. Alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

- B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 - 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
 - 1. Provide access for and cooperate with testing agency.
 - 2. Confirm date of start of testing at least 10 days prior to actual start.
 - 3. Allow at least 4 business days on site for testing agency activities.
 - 4. Achieve and maintain specified ambient conditions.
 - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Follow recommendations of testing agency.
- B. Perform following operations in the order indicated:

1. Preliminary cleaning.
2. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
3. Specified remediation, if required.
4. Patching, smoothing, and leveling, as required.
5. Other preparation specified.
6. Adhesive bond and compatibility test.
7. Protection.

3.02 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.03 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.04 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with recommendations of testing agency.
- C. Comply with requirements and recommendations of floor covering manufacturer.
- D. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- E. Do not fill expansion joints, isolation joints, or other moving joints.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.

3.07 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

This page intentionally left blank

**SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Gypsum sheathing.
- C. Cementitious backing board.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.
- F. Acoustic (sound-dampening) wall and ceiling board.

1.02 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.
- C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
- D. 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.
- E. 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; 2022.
- F. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.
- G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.
- I. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.
- J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- K. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.
- L. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).
- M. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- P. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- Q. GA-216 - Application and Finishing of Gypsum Panel Products; 2018.
- R. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- S. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing.
- C. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of documented experience.
- B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS**2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
 - 1. Fire-Resistance-Rated Partitions: As indicated on the plans.
 - 2. Head of Fire-Resistance-Rated Partitions: As indicated on the plans.
 - 3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 4. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 5. USG Corporation: www.usg.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm) Type X.
 - b. Ceilings: 5/8 inch (16 mm) Type X.
- C. Abuse Resistant Wallboard:
 - 1. Application: High-traffic areas indicated.
 - 2. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 4. Soft Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 6. Type: Fire-resistance-rated Type X, UL or WH listed.

7. Thickness: 5/8 inch (16 mm).
8. Edges: Tapered.
- D. Backing Board For Wet Areas:
 1. Application: Horizontal surfaces behind tile in wet areas including countertops.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch (16 mm).
- E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Type X Thickness: 5/8 inch (16 mm).
 4. Edges: Tapered.
- F. Backing for plaster finish: Cement board.
 1. Application: Horizontal and vertical surfaces behind (2) coat 3000psi plaster.
 2. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
 - a. Thickness: 5/8 inch (16 mm).
- G. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper-faced, high-density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
 1. Type X Thickness: 5/8 inch (16 mm).
 2. Long Edges: Tapered.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- H. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
 1. Application: Exterior sheathing, unless otherwise indicated.
 2. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 3. Core Type: Regular.
 4. Regular Board Thickness: 1/2 inch (13 mm).
 5. Edges: Square.
- I. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
 2. Types: Type X, in all locations.
 3. Type X Thickness: 5/8 inch (16 mm).
 4. Edges: Tapered.

2.03 GYPSUM WALLBOARD ACCESSORIES

- A. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
 1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 2. Tape Thickness: 1/4 inch (6 mm).
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: See Section 07 25 00.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 1. Corner Beads: Low profile, for 90 degree outside corners.

- 2. Expansion Joints:
 - a. Type: V-shaped PVC with tear away fins.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners.
 - 2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Joint Compound: Setting type, field-mixed.
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place two beads continuously on substrate before installation of perimeter framing (track) members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.
 - a. Provide fire rated acoustical sealant in all rated walls in strict compliance with requirements of assembly listing.

3.03 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.

- G. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- H. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as directed.
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.05 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive, egg-shell, semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive flat paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

This page intentionally left blank

**SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Metal partition framing.
- B. Framing accessories.

1.02 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).
- B. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.
- G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- H. 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; 2022.
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- J. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate component details, stud layout, framed openings, anchorage to structure, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
 - 2. Marino: www.marinoware.com/#sle.
 - 3. The Steel Network, Inc: www.SteelNetwork.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
 - 1. Studs: C shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
 - 5. Resilient Furring Channels: Single leg configuration; 1/2 inch (12 mm) channel depth.
 - a. Products:
 - 1) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- C. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- E. Non-Loadbearing Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 - 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - b. Height: 23-3/4 inches (603 mm) and 35-3/4 inches (908 mm).
 - c. Products:
 - 1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
 - 3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
 - 4. Sheet Metal Backing: 0.036 inch (0.9 mm) thick, galvanized.
 - 5. Fasteners: ASTM C1002 self-piercing tapping screws.
 - 6. Anchorage Devices: Powder actuated.

2.03 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- E. Extend partition framing as indicated on drawings.
- F. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.
- G. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- H. Align and secure top and bottom runners at 24 inches (600 mm) on center.
- I. At partitions indicated with an acoustic rating:
 - 1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
- J. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- K. Install studs vertically at 16 inches (400 mm) on center.
- L. Align stud web openings horizontally.
- M. Secure studs to tracks using fastener method. Do not weld.
- N. Stud splicing is not permissible.
- O. Fabricate corners using a minimum of three studs.
- P. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.
- Q. Brace stud framing system rigid.
- R. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.
- S. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- T. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.
- U. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches (150 mm).

3.03 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.

- D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

**SECTION 09 22 40
SECURITY MESH****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Expanded metal security mesh for penetration barrier behind gypsum board.
- B. Accessories.

1.02 REFERENCE STANDARDS

- A. 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; 2018a.
- B. ASTM F1267 - Standard Specification for Metal, Expanded, Steel; 2018 (Reapproved 2023).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.
- C. Samples:
 - 1. Submit two samples, 6 by 6 inch (150 by 150 mm) in size illustrating lath material and finish.
 - 2. Submit two samples of attachment clips.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Amico Security: www.amicosecurity.com.
 - 1. Basis of Design or approved substitution.
- B. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
- C. McNichols: www.mcnichols.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Product: ASM 1.5-9F Medium Security mesh.
- B. Physical Properties:
 - 1. Carbon steel - meet or exceed ASTM A-1011.
 - 2. Panel Size:
 - a. Width: 48 inch minimum.
 - b. Length: 96 inch minimum.
 - 3. Mesh Size:
 - a. Diamond: 1.330 inch x 3.200 inch bond to bond with 9 diamonds per 12 inch.
 - b. Opening: 1.000 inch x 2.653 inch - 76% open area.
 - c. Strand width: 0.158 inch.
 - d. Strand thickness: 0.108 inch.
 - 4. Weight: 1.05 lbs/sf.
- C. Finish: Mill.

2.03 ACCESSORIES

- A. Manufacturers standard fastener clip with appropriate self tapping screws

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready to receive work and conditions are suitable for application.
- B. Do not begin until unacceptable conditions have been corrected.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install security mesh panels and fastener clips in accordance with manufacturer's printed instructions.
- B. Joints shall be either staggered or butt type - overlapping is not allowed.
- C. Panels shall join on framing members.
 - 1. In the event a panel does not join on a framing member the panels shall be tied with 18ga wire at same frequency as clips.

END OF SECTION

**SECTION 09 24 00
CEMENT PLASTERING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Cement plastering.

1.02 REFERENCE STANDARDS

- A. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- B. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.
- C. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2020b.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.05 FIELD CONDITIONS

- A. Interior Plaster Work: Maintain minimum ambient temperature of 50 degrees F (10 degrees C) during installation of plaster and until fully cured.

PART 2 PRODUCTS**2.01 CEMENT PLASTER APPLICATIONS**

- A. Solid Plaster Base: Cement board.
 - 1. Plaster Type: Factory prepared plaster mix.
 - 2. Number of Coats: Two.
 - 3. First Coat: Apply to a nominal thickness of 1/4 inch (6 mm).
 - 4. Finish Coat: Apply to a nominal thickness of 1/8 inch (3 mm).
 - 5. Finish: Acrylic.

2.02 FACTORY PREPARED CEMENT PLASTER

- A. Premixed One-Coat Base: Mixture of Type III Portland cement complying with ASTM C150/C150M, hydrated lime complying with ASTM C207, fibers and other approved ingredients; install in accordance with ASTM C926.
- B. Premixed Finish Coating: Same product as base coat.
- C. Primer: Acrylic, as recommended by coating manufacturer and compatible with plaster base coat.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 PREPARATION

- A. Apply dash bond coat of plaster to solid bases and moist cure for at least 24 hours before applying first coat of jobsite mixed plaster.

3.03 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.04 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

3.05 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet (6 mm in 3 m).

3.06 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

**SECTION 09 30 00
TILING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Non-ceramic trim.

1.02 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- B. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
- C. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
- D. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
- E. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
- F. ANSI A118.11 - American National Standard Specifications for EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2017 (Reaffirmed 2022).
- G. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).
- H. ANSI A136.1 - American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile; 2020.
- I. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- J. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, ceramic accessories, and setting details.
- D. Selection Samples: Color charts illustrating full range of colors and patterns.
- E. Approval Samples: Samples of actual tiles for selection.
- F. Certificate: Certify products of this section meet or exceed specified requirements.
- G. Installer's qualification statement.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
- C. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
- C. Deliver and store products in manufacturer's unopened packaging until ready for installation.
- D. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

1.08 MAINTENANCE MATERIALS

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to three (3) percent for each type, composition, color, pattern, size and shape installed.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. TRINITY TILE: www.trinitytile.com.
- B. Porcelain Tile, Type FT-1: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 12x24.
 - a. Pattern: Running Bond
 - 3. Color(s): To be selected by Architect from manufacturer's full range.
 - a. Allow for three colors as selected by Architect from manufacturer's full range.
 - 4. Products:
 - a. Trinity Tile; Bartow, Gray, Matte: www.Trinity Tile.com/#sle.
 - 1) Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Porcelain Tile, Type FT-2: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 12 by 24 inch (300 by 600 mm), nominal.
 - 3. Color(s): To be selected by Architect from manufacturer's full range.
 - a. Allow for three colors as selected by Architect from manufacturer's full range.
 - 4. Products:
 - a. Trinity Tile: www.trinitytile.com/#sle.
 - 1) Famed Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Ceramic Tile, Type WT-1: ANSI A137.1 standard grade.

1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 2.5" x 15" inch (____by____ mm), nominal.
 3. Color(s): To be selected by Architect from manufacturer's full range.
 4. Products:
 - a. Trinity Tile; Bassi, White Brick, Matte: www.trinitytile.com/#sle.
 - 1) Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Ceramic Tile, Type WT-3: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 4" x 12, grid.
 3. Color(s): To be selected by Architect from manufacturer's full range.
 4. Products:
 - a. Trinity Tile; Wall Tile Collection, Mist, Glossy: www.daltile.com/#sle.
 - 1) Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Ceramic Tile, Type WT-4: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 1" x 12", Horizontally Stacked.
 3. Color(s): To be selected by Architect from manufacturer's full range.
 4. Products:
 - a. Trinity Tile; Bartow, White, Matte: www.daltile.com/#sle.
 - 1) Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRIM AND ACCESSORIES

- A. Trim: Matching bullnose shapes in sizes coordinated with field tile.
1. Applications:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 2. Manufacturers: Same as for tile.
- B. Non-Ceramic Trim - Walls: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
 - a. Open edges of wall and floor tile.
 - b. Wall corners, outside.
 - c. Borders and other trim as indicated on drawings.
 2. Products:
 - a. Schluter-Systems; Schiene: www.schluter.com/#sle.
 - 1) Product: Schluter Quadec Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Non-Ceramic Trim - Floors: Brushed stainless steel, style and dimensions to suit application.
1. "L" shaped profile: 1/8 inch (3.2 mm) wide visible surface integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 - a. Manufacturers:
 - 1) Schluter-Systems: www.schluter.com/#sle.
 - (a) Product: Schluter SCHIENE Basis of Design or approved substitution.
 - 2) Genesis APS International: www.genesis-aps.com/#sle.
 - 3) Dural USA, Inc.: www.dural.de.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 2. Sloped profile: Sloped exposed surface, vertical leading edge, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 - a. Manufacturers:

- 1) Schluter-Systems: www.schluter.com/#sle.
 - (a) Product: Schluter RENO-U Basis of Design or approved substitution.
- 2) Genesis APS International: www.genesis-aps.com/#sle.
- 3) Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Standard Grout: ANSI A118.6 standard cement grout.
 1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
 3. Color: As selected by Architect from manufacturer's full line.
- C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 1. Applications: All floor locations.
 2. Color: As selected by Architect from manufacturer's full line.
 3. Products:
 - a. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com/#sle.
 - b. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
 - d. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, modified silane polymer, or urethane sealant; moisture- and mildew-resistant type.
 1. Applications: Between tile and plumbing fixtures.
 2. Color: As selected by Architect from manufacturer's full line.
 3. Products:
 - a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.
 - b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 1. Composition: Water-based colorless silicone.

2.06 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 1. Crack Resistance: No failure at 1/8 inch (3.2 mm) gap, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.

- B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

3.02 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to feather edge.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.
- B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- D. Form internal angles square and external angles bullnosed.
- E. Install non-ceramic trim in accordance with manufacturer's instructions.
- F. Install thresholds where indicated on drawings.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, on ground, with standard grout, unless otherwise indicated on drawings.
 - 1. Where waterproofing membrane is indicated on drawings, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout, on ground.

3.05 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.06 CLEANING

- A. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

This page intentionally left blank

**SECTION 09 51 00
ACOUSTICAL CEILINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Supplementary insulation above ceiling.

1.02 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning and junctions with other ceiling finishes.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 12 inches (300 mm) long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.07 MAINTENANCE MATERIALS

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to five (5) percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to two (2) percent of amount installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 2. Certaineed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
 3. USG Corporation: www.usg.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
 1. Classification: ASTM E1264 Type A.
 2. Size: 24 by 24 inches (610 by 610 mm).
 3. Thickness: ____ inch (____ mm).
 4. Tile Edge: Angled tegular.
 5. Color: White.
 6. Suspension System: Exposed grid.
 7. Product:
 - a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - b. Certaineed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation; Millenia Acoustical Panels: www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Acoustical Panels, Type ACT-4: Painted mineral fiber, with the following characteristics:
 1. Classification: ASTM E1264 Type A.
 2. Size: 24 by 48 inches (610 by 1219 mm).
 3. Thickness: ____ inch (____ mm).
 4. Tile Edge: Angled tegular.
 5. Color: White.
 6. Suspension System: Concealed.
 7. Product:
 - a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - b. Certaineed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation; Millenia Acoustical Panels: www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Acoustical Panels, Type ACT-5: Painted mineral fiber, with the following characteristics:
 1. Classification: ASTM E1264 Type A.
 2. Size: 24 by 60 inches (____ by ____ mm).
 3. Thickness: ____ inch (____ mm).
 4. Tile Edge: Angled tegular.
 5. Color: White.
 6. Suspension System: Concealed.
 7. Product:
 - a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - b. Certaineed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation; Millenia Acoustical Panels: www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Acoustical Panels, Type ACT-6: Painted mineral fiber, with the following characteristics:

1. Classification: ASTM E1264 Type A.
 2. Size: 24 by 72 inches (____ by ____ mm).
 3. Thickness: ____ inch (____ mm).
 4. Tile Edge: Angled tegular.
 5. Color: White.
 6. Suspension System: Concealed.
 7. Product:
 - a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - b. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation; Millenia Acoustical Panels: www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Acoustical Panels, Type ACT-2: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type A.
 2. Size: 30 by 30 inches (762 by 762 mm).
 3. Thickness: 1 inches (25 mm).
 4. Panel Edge: SLT.
 5. Color: White.
 6. Products:
 - a. Armstrong World Industries, Inc; Calla: www.armstrongceilings.com/#sle.
 - b. Certainteed Architectural; ____: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation: www.usg.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- G. _____
- H. ASTM E1264 Type A, Form A3 - Mineral fiber with scrubbable finish, typical in commercial kitchen/food prep areas.
- I. _____
- J. _____
- K. ASTM E1264 Type A, Form A4 - Mineral base with plastic or aluminum faced overlay; cleanroom classified option.
- L. _____
- M. _____
- N. ASTM E1264 Types C and D - Metal-faced acoustical panels (Type C) and planks (Type D).
- O. _____
- P. _____
- Q. ASTM E1264 Type F - Wood with a mineral or glass fiber backing, Forms F1 (perforated) and F2 (non-perforated).
- R. _____
- S. _____
- T. ASTM E1264 Type G - Gypsum, Forms G1 (perforated) and G2 (non-perforated).
- U. _____
- V. _____
- W. ASTM E1264 Type J - Melamine foam tiles, planks, and panels.
- X. _____

2.03 SUSPENSION SYSTEMS

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.

- B. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch (24 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions and specified Seismic Design Category.
 - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected ceiling plan.
 - 1. Where no reflected ceiling plan is indicated; layout system to a balanced grid design with no edge units smaller than 4 inches (100 mm), unless directed otherwise by Architect.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to longest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

This page intentionally left blank

**SECTION 09 66 23
RESINOUS MATRIX TERRAZZO FLOORING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Divider strips.

1.02 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- B. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.
- C. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected parties.
 - 1. Review methods and procedures related to terrazzo.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.
- D. Samples: Submit two samples, 6 inch (150 mm) by 6 inch (150 mm) in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.
- E. Samples for Initial Selection: Provide manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.
- F. Samples for Verification: For each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions. Prepare samples of same thickness and from same material to be used for the Work.
- G. Concrete Subfloor Test Report: Submit a copy of the alkalinity (pH) test reports.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.
- J. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.
- K. Sample Warranties: For manufacturer's special warranties.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Associate member firm of the National Terrazzo and Mosaic Association, Inc.
- C. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by matrix manufacturer.
 - 3. Contractor member of the National Terrazzo and Mosaic Association, Inc.

- D. Source Limitations: Obtain primary Epoxy Terrazzo Flooring System materials including membranes, primers, resins, and hardening agents from a single manufacturer.
 - 1. Obtain aggregates, solvents, divider strips, sealers and cleaners from source recommended by primary materials manufacturer.

1.06 MOCK-UP

- A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 100 square feet (9 square m).
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's undamaged, unopened containers with a label on each container clearly marked with the following information:
 - 1. Product name.
 - 2. Manufacturer's name.
 - 3. Component designation (A or B, etc.).
 - 4. Ratio of component mixture.
 - 5. CHEMTREC Emergency Response Information.
- B. Store terrazzo materials in a dry, secure area.
- C. Maintain minimum temperature of 60 degrees F (16 degrees C).
- D. Keep products away from fire or open flame.

1.08 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F (10 degrees C) or above 90 degrees F (32 degrees C).
- B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.
- C. Provide ambient lighting level of 50 ft candles (540 lx), measured at floor surface.
- D. Field Measurements, Precast Terrazzo: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- E. Acceptable Substrate Conditions:
 - 1. Flatness Tolerance: Maximum variation from flatness of 1/4 inch in 10 feet (6 mm in 3 m).
 - 2. Concrete floor Finish: Steel trowel finish.
 - 3. Allow concrete to receive epoxy terrazzo to cure for at least 30 days before beginning installation process.
 - 4. No curing agents to be used in areas to receive terrazzo.
 - 5. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible to ACI recommendations.
 - 6. Prepare concrete mechanically by shot-blasting. Grinding of slab is not sufficient surface preparation, except for edges and corners not accessible with shot blasting equipment. Surface preparation results should achieve a CSP3-CSP4 profile according to International Concrete Repair Institute Guideline No. 03732.
- F. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- G. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- H. Provide protection from other trades prior to final acceptance by owner.

1.09 WARRANTY

- A. Special Warranty: Manufacturer and installer, jointly, agree to provide labor and material to repair (and if necessary to replace) components of epoxy terrazzo flooring system that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, loss of bond and damage due to normal wear and tear.
 - 2. Failures do not include the following:
 - a. Damage due to bubbling or loss of adhesion due to moisture penetration through the substrate.
 - b. Acts of God or other elements beyond scope of protection of this system.
 - c. Reflective cracks from substrate.
- B. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Master Terrazzo Technologies: www.masterterrazzo.com.
 - 1. Basis of Design or approved substitution.
- B. Key Resin Company: www.keyresin.com/#sle.
- C. Terrazzo & Marble Supply Companies: www.tmsupply.com/#sle.
 - 1. David Allen Company: www.davidallen.com/#sle.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors:
 - 1. Thickness: 3/8 inch (9 mm), nominal.
 - 2. Color(s): To be selected by Architect from manufacturer's full range.
 - a. Three color pattern as delineated in the drawings.
 - 3. Aggregate Type: Marble chips.
 - 4. Aggregate Size: #2's, #1's and #0's, conforming to NTMA gradation standards.
- B. Wall Base:
 - 1. Thickness: Same as floors.
 - 2. Aggregate Type and Size: Same as floors.
- C. Stairs - Treads and Risers:
 - 1. Thickness: 1-1/2 inch (38 mm), minimum.
 - 2. Color(s): Same as adjacent floor.
 - 3. Aggregate Type and Size: Same as floors.

2.03 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
 - 1. Mix Proportions: As required to achieve appearance specified.
 - 2. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - a. Color: To be selected by Architect from manufacturers full range.
 - b. Pattern: As indicated on plans.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Epoxy Resin: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - 1. Physical Properties without Aggregates:
 - a. Hardness: ASTM D2240 70-85 Shore D.
 - b. Minimum Tensile Strength: 4,800 psi (33 mPA) per ASTM D638 for a 2-inch (50 mm) specimen made using a "C" die per ASTM D412.

- c. Minimum Compressive Strength: 12,000 psi (83 mPA) per ASTM D695, Specimen B cylinder.
- d. Chemical Resistance: No deleterious effects by contaminants listed below after 7-day immersion at room temperature per ASTM D1308.
 - 1) Distilled water.
 - 2) Mineral water.
 - 3) Isopropanol.
 - 4) Ethanol.
 - 5) 0.025 percent detergent solution.
 - 6) 1 percent soap solution.
 - 7) 10 percent sodium hydroxide.
 - 8) 10 percent hydrochloric acid.
 - 9) 5 percent acetic acid.
- 2. Physical Properties with Aggregates: For resin blended with Crolina marble color chips, ground, grouted, and cured per requirements in NTMA's "Guide Specification for Epoxy Terrazzo," comply with the following:
 - a. Flammability: Self-extinguishing, maximum extent of burning 0.25 inch (6 mm) per ASTM D635.
 - b. Linear Coefficient of Thermal Expansion: 25.0×10^{-6} in/in per °F (11.4×10^{-7} cm/cm per °C) for temperature range of -12° to 140° F (-24° to 60° C) per ASTM D696.
 - c. Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 the Epoxy terrazzo shall comply with the following value: 100 percent concrete failure minimum, with 300 psi (2.1 mPA) minimum tensile strength.
- D. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
- E. Finishing Grout: Epoxy, color to match terrazzo matrix.

2.04 ACCESSORIES

- A. Divider Strips: 1/8 inch (3 mm) thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch (3 mm) nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch (3 mm) wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Control Joint Filler: Flexible, grindable, epoxy joint filler, 100 percent solids, with the following properties:
 - 1. Tensile Strength: ASTM D2370 at 68° F (20° C) 1,600 psi (11 mPA)
 - 2. Elongation: ASTM D2370 at 68° F (20° C) 100 percent
 - 3. Tensile Modulus: ASTM D2370 at 68° F (20° C) 27,800 psi (192 mPA)
 - 4. Color: As selected by the Architect from manufacturers full range.
- E. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for terrazzo flooring installation by testing for alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by terrazzo flooring manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions.
- C. Apply primer in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install control joint strips straight and flat to locations indicated.
- B. Install divider strips according to pattern approved on shop drawings.
- C. Place terrazzo mix over substrate to thickness indicated.

3.04 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.
 - 1. Rough Grinding: Grind with 50-60 grit or finer stones or with comparable diamond plates.
 - 2. Intermediate Grinding: Follow initial grind with 200 to 220 grit or finer stones.
- C. Grouting: Prior to final grinding, apply epoxy grout as follows:
- D. Cleanse floor with clean water and rinse thoroughly.
- E. Remove excess rinse water by wet vacuum and machine until completely dry.
- F. Apply epoxy grout to fill voids.
- G. Fine Grinding: Grind with 200 grit diamond pads or finer stones until all grout is removed from surface.
- H. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding.
- I. Produce surface with a minimum of 70 percent aggregate exposure.
- J. Polishing: Grind at 400 grit with diamonds pads as final step.
- K. Apply grout to fill voids exposed from grinding.
- L. Remove grout coat by grinding, using a fine grit abrasive.

3.05 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet (6 mm in one m).
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch (3 mm).

3.06 CLEANING

- A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.
- B. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.
- C. Polish surfaces in accordance with manufacturer's instructions.

3.07 PROTECTION

- A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION

**SECTION 09 67 00
FLUID-APPLIED FLOORING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fluid-applied flooring and base.

1.02 REFERENCE STANDARDS

- A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Samples: Submit two samples, 12 by 12 inch (300 by 300 mm) in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of this section with minimum three years of documented experience.
 - 1. Approved by manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum three years of documented experience.
 - 2. Approved by manufacturer.

1.06 MOCK-UPS

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 - 1. Installation: Use same materials and methods for use in the work.
 - 2. Location: Locate where directed.
 - 3. Minimum size: 96 inches by 96 inches.
 - 4. Number of Mock-Ups to be Prepared: One.
 - 5. Use same materials and methods for use in the work.
 - 6. Locate where directed.
 - 7. Minimum Size: 48 inches by 48 inches (1220 mm by 1220 mm).
- B. Obtain approval of mock-up by Architect before proceeding with work.
- C. Approved mock-up may not remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.08 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fluid-Applied Flooring:
 - 1. Flowcrete Americas; _____: www.flowcreteamericas.com/#sle.
 - 2. Key Resin Company: www.keyresin.com/#sle.
 - 3. PPG Flooring: www.pittsburghpaintsco.com/#sle and www.ppgpmc.com/home.aspx/#sle.
 - 4. Sherwin-Williams High-Performance Flooring; _____: www.sherwin-williams.com/resin-flooring/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring Epoxy Resin: Resilient polymer.
 - 1. Prime Coat: Two component penetrating damp-proof epoxy, Key 502.
 - 2. Aggregate: Blended colored quartz sand for base, 30-40 mesh.
 - 3. Membrane/Matrix: Key 400 Urethane Elastomer for basecoat membrane and for aggregate reinforced membrane.
 - 4. Top Coat: Clear two component aliphatic polyaspartic, Key 470 or Key 471.
 - 5. System Thickness: 1/8 inch (3.2 mm), nominal, dry film thickness (DFT).
 - 6. Texture: Slip resistant.
 - 7. Sheen: High gloss.
 - 8. Color: As selected by Architect from manufacturer's full range.
 - 9. Products:
 - a. Key Resin Company: www.keyresin.com/#sle.
 - 1) Key Lastic DE System Basis of Design or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Base Caps: Extruded mill finished aluminum with projecting base of 1/8 inch (3 mm); .
- B. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.
- C. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity: obtain instructions if test results are not within limits recommended by flooring materials manufacturer.
- D. Verify that floor mounted utilities are in correct location.

3.02 PREPARATION

- A. Clean and prepare concrete surfaces according to ICRI 310.2R, CSP 3.
- B. Apply primer to surfaces required by flooring manufacturer.

3.03 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- C. Verify that required floor-mounted utilities are in correct location.

3.04 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Prepare concrete surfaces according to ICRI 310.2R, CSP 3.
- C. Vacuum clean substrate.
- D. Apply primer to surfaces required by flooring manufacturer.

3.05 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Finish to smooth level surface.

3.06 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

This page intentionally left blank

**SECTION 09 68 13
TILE CARPETING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered.

1.02 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- C. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Submit two, 12 inch (300 mm) long samples of edge strip and base cap.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.06 MAINTENANCE MATERIALS

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Carpet Tile: Furnish quantity of full-size units equal to five (5) percent for each type, color, pattern and size installed.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Shaw Contract Group: www.shawcontractgroup.com.
- B. Interface, Inc: www.interface.com/#sle.
- C. Milliken & Company; OBEX Tile - CutX: www.milliken.com/#sle.
- D. Mohawk Group: www.mohawkgroup.com/#sle.
 - 1. Basis of Design or approved substitution.
- E. Patcraft: www.patcraft.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting, Type CPT-1: _____, manufactured in one color dye lot.
1. Product: Smart Casual GT351 manufactured by Mohawk or approved substitution.
 - a. CPT-1:989 Charcoal Wash
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Brick Ashlar.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-1.
 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 5. Primary Backing Material: Synthetic.
- B. Tile Carpeting, Type CPT-2: _____, manufactured in one color dye lot.
1. Product: Distressed Twill GT469 manufactured by Mohawk or approved substitution.
 - a. CPT-2: 989 Charcoal
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Herringbone.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-2.
 2. Tile Size: 12x36 inch (300x900 mm), nominal.
 3. Thickness (finished pile): 0.104 inch (2.64 mm).
 4. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 6. Primary Backing Material: Synthetic.
 7. Secondary Backing Material: EcoFlex NXT.
- C. Tile Carpeting, Type CPT-3: _____, manufactured in one color dye lot.
1. Product: Color Canvas GT484 manufactured by Mohawk or approved substitution.
 - a. CPT-3: 929 Cityscape.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Half Lap.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-3.
 2. Tile Size: 12x36 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 5. Primary Backing Material: Synthetic.
 6. Secondary Backing Material: EcoFlex.
- D. Tile Carpeting, Type CPT-4: _____, manufactured in one color dye lot.
1. Product: Distressed Twill GT469 manufactured by Mohawk or approved substitution.
 - a. CPT-4: 969 Iron.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Herringbone Install.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-4.
 2. Tile Size: 12x36 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

5. Primary Backing Material: Synthetic.
 6. Secondary Backing Material: EcoFlex.
- E. Tile Carpeting, Type CPT-5: Static Dissipative Tile, manufactured in one color dye lot.
1. Product: Discovery ECO - SD Carpet Tile manufactured by Mohawk or approved substitution.
 - a. CPT-5: Shackleton Grey.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Brick Ashlar.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-5.
 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
- F. Tile Carpeting, Type CPT-6: _____, manufactured in one color dye lot.
1. Product: Made To Last GT350 manufactured by Mohawk or approved substitution.
 - a. CPT-6: 938 Acid Wash.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Half Lap.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-6.
 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 5. Primary Backing Material: Synthetic.
 6. Secondary Backing Material: EcoFlex.
- G. Tile Carpeting, Type CPT-7: _____, manufactured in one color dye lot.
1. Product: Mycoloop GT355 manufactured by Mohawk or approved substitution.
 - a. CPT-7: 954 Carbonnier.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Brick Ashlar.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-7.
 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 5. Primary Backing Material: Synthetic.
 6. Secondary Backing Material: EcoFlex.
- H. Tile Carpeting, Type CPT-8: _____, manufactured in one color dye lot.
1. Product: Mycoloop GT355 manufactured by Mohawk or approved substitution.
 - a. CPT-8: 945 Aniseed Funnel.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Brick Ashlar.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-8.
 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 5. Primary Backing Material: Synthetic.
 6. Secondary Backing Material: EcoFlex.

- I. Tile Carpeting, Type CPT-9: _____, manufactured in one color dye lot.
 - 1. Product: Made to Last GT350 manufactured by Mohawk or approved substitution.
 - a. CPT-9: 838 Sand Wash.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - 2) Installation Pattern: Brick Ashlar.
 - 3) Allow for three colors as selected by Architect from manufacturer's full range for CPT-9.
 - 2. Tile Size: 24x24 inch (600x600 mm), nominal.
 - 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 5. Primary Backing Material: Synthetic.
 - 6. Secondary Backing Material: EcoFlex.

2.03 ACCESSORIES

- A. Edge Strips: Rubber, color as selected.
- B. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for alkalinity (pH).
 - 1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

This page intentionally left blank

SECTION 09 69 33
LOW-PROFILE FIXED HEIGHT ACCESS FLOORING - FREEAXEZ**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fixed height, low-profile access flooring system.

1.02 REFERENCE STANDARDS**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets, including loading capacities, materials, finishes, dimensions of components, profiles, and accessories.
- C. Shop Drawings: Indicate floor layout, appurtenances or interruptions, edge details, ramps and _____.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Access Flooring - Low-Profile Fixed Height:
 - 1. FreeAxez; Gridd 70: www.freeaxe.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Uniform Load: 100 psf (4.79 kPa), when tested in accordance with ASTM E2322.
- B. Concentrated Load: Over an area of 1 inch by 1 inch (25 mm by 25 mm), 200 pounds (91 kg) at any location, in compliance with ICC (IBC).
- C. Concentrated Load: Over an area of 2.5 feet by 2.5 feet (762 mm by 762 mm), 2000 pounds (907 kg) minimum, in compliance with ICC (IBC) Table 1607.1, for access floor systems.

2.03 ACCESS FLOORING - LOW-PROFILE FIXED HEIGHT

- A. Access Flooring – Low-Profile Fixed Height: Factory-fabricated system consisting of fixed height base units forming a grid of cable trenches that are covered with removable steel floor plates; provide all components and accessories required for complete installation and as indicated.
 - 1. System designed for installation without adhesives or fasteners.
 - 2. System designed for integration with access flooring manufacturer's modular power distribution system.
- B. Finished Floor Elevation: 2.75 inches (70 mm) nominal height above building structural floor.
- C. Components:
 - 1. Undersheet: Manufacturer's standard roll material.
 - 2. Base Units: Steel module with integral support legs.
 - 3. Floor Plate Panels: Galvanized steel plate of size and shape to cover trench spaces and to create a uniform floor surface.
 - 4. Module Size: 19.625 inches by 19.625 inches (500 mm by 500 mm) consisting of one base unit, two channel plates, and one corner plate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements are as shown on shop drawings.
- B. Verify that overhead ceiling work is complete, and wall surfaces have been painted with primer coat.
- C. Verify that substrate is clean, dry, and free of deleterious material affecting access flooring installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Vacuum clean substrate surfaces.

3.03 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Install undersheet with edges butted, without wrinkles, and contiguous throughout floor system work area.
- C. Connect components without adhesive or mechanical fasteners.
- D. Install system border components to provide a close fit with adjoining construction, with voids between 1/2 and 3/4 inch (13 and 19 mm) where panels abut vertical surfaces.
- E. Exposed Edge and Corner Trim: Install at locations indicated on shop drawings and as required by field conditions.
 - 1. Install edge trim at exposed sides.
- F. Secure ramps to concrete subfloor using manufacturer's recommended anchors.

3.04 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's maintenance personnel to adjust, operate, and maintain access flooring system.

3.05 PROTECTION

- A. Protect installed access flooring system from damage due to subsequent construction until Date of Substantial Completion.

3.06 MAINTENANCE

END OF SECTION

**SECTION 09 70 00
ALUMINUM MILLWORK TRIM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum millwork trim system.

1.02 REFERENCE STANDARDS

- A. AAMA 607.1 - Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum; 1997.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate product description, including compliance with specified requirements and installation requirements. Mark manufacturer's brochures to include only those products proposed for use.
- C. Samples: Submit two samples of each type of profile in same size and finish as required for the project.
- D. Manufacturers Installation Instructions: Include attachment requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Fabricator Qualifications: Company specializing in fabricating products specified in this section, with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Storage:
 - 1. Stack accessories off floor on pallets or similar platforms providing continuous support for accessories to prevent sagging. Stack accessories so that long lengths are not over short lengths.
- C. Handle materials to prevent damage to surfaces, edges, and ends of sheet metal items. Reject and remove damaged material from site.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer warranty against defects in materials and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fry Reglet Corporation: www.fryreglet.com.
 - 1. Basis of Design or approved substitution.
- B. Gordon, Inc.: www.gordon-inc.com.

- C. Eagle Mouldings: www.eagle-aluminum.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Clear Anodized finish.
 - 1. Architectural 200R1 medium etch (AA-M32c10A21), clear color.

2.03 COMPONENTS

- A. Description: Manufacturers standard and custom fabricated aluminum millwork shapes and profiles as indicated on the drawings.

2.04 ACCESSORIES

- A. Fasteners: Concealed.
 - 1. Type and quantity per manufacturer - provided by installer.
 - 2. Exposed fasteners not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that conditions are acceptable for product installation in accordance with manufacturer's instructions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.

3.03 TOLERANCES

- A. Allowable tolerances in horizontal planes.
 - 1. Variation from level: + 1/8" in 12'-0".
 - 2. Variation in plane of adjacent wallboard panels prior to joint treatment: 1/16".
- B. Allowable tolerances in framed vertical construction.
 - 1. Position: + 1/8" maximum variation from design position.
 - 2. Alignment: 1/8" maximum in any continuous wall, line, or surface.

3.04 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

3.05 PROTECTION

- A. Protect accessories from damage until date of Substantial Completion. Replace accessories which become damaged.

END OF SECTION

**SECTION 09 81 00
ACOUSTIC INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Batt Acoustical Insulation.

1.02 REFERENCE STANDARDS

- A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- F. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.
- G. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- H. National Fire Protection Association (NFPA) Life Safety Code.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- 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.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of ten years of documented experience manufacturing products in this section shall provide all products listed.
- B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years of documented experience successfully installing insulation on projects of similar type and scope as specified in this section.

1.05 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. Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.
- C. Handle materials to avoid damage.
- D. Ensure that products of this section are supplied in time to prevent interruption of construction progress.

1.06 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.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. CertainTeed Corporation: www.certainteed.com.
 - 1. Basis of Design or approved substitution.
- B. Johns Manville: www.jm.com.
- C. Owens-Corning Fiberglass Corporation: www.owenscorning.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 APPLICATIONS

- A. Interior Partitions: Batt type.

2.03 MATERIALS

- A. Acoustical/Thermal Insulation: CertainTeed Sound Attenuation NoiseReducer Batts preformed glass fiber batt insulation (Basis of Design or approved substitution).
 - 1. Location: Between studs - friction fit, coordinate thickness with wall type.
 - 2. Facing: ASTM C 665, Type 1, Unfaced.
 - a. Fire Hazard Classification ASTM E84.
 - b. Maximum Flame Spread Index of 25.
 - c. Maximum Smoke Developed Index of 50.
 - d. Noncombustible ASTM E 136, passes.
 - 3. Thermal Resistance: R of 11 (RSI 1.9) and R of 19 (RSI 3.3).
 - 4. Thickness: 3 1/2 inches (89 mm) and 6 1/4" (159 mm).
 - 5. Width: As required by project conditions.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all interior walls, partitions, and ceiling assembly construction has been completed to the point where the insulation may correctly be installed.
- C. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

3.04 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

**SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sound-absorbing panels.

1.02 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.
- E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch (305 by 305 mm), showing construction, edge details, and fabric covering.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

PART 2 PRODUCTS**2.01 FABRIC-COVERED SOUND-ABSORBING UNITS**

- A. Manufacturers:
 - 1. Sound Seal: www.soundseal.com.
 - 2. Essi Acoustical Products Company: www.essiacoustical.com/#sle.
 - 3. LAMVIN: www.lamvin.com/#sle.
 - 4. Armstrong; Soundsoak 85 Fiberglass; www.armstrong.com/#sle.
 - a. Basis of Design.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. General:
 - 1. Prefinished, factory assembled fabric-covered panels.
 - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- C. Fabric-Covered Acoustical Panels for Walls:
 - 1. Panel Core: Manufacturer's standard core.
 - 2. Panel Size: Custom as indicated in the plans.
 - 3. Panel Thickness: 1 inch (24 mm).
 - 4. Edges: Bevel.

5. Corners: Square.
6. Fabric: Woven polyester.
7. Color: As selected by Architect from manufacturer's full range.
 - a. Allow for three colors.
8. Mounting Method: Back-mounted with mechanical fasteners.

2.02 FABRICATION

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch (1.6 mm) for thickness, overall length and width, and squareness from corner to corner.

2.03 ACCESSORIES

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
 1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Install acoustical units to construction tolerances of plus or minus 1/16 inch (1.6 mm) for the following:
 1. Plumb and level.
 2. Flatness.
 3. Width of joints.

3.03 CLEANING

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

**SECTION 09 91 13
EXTERIOR PAINTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Roof mechanical equipment screen.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other types of tiles.
 - 8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 9. Glass.
 - 10. Concealed pipes, ducts, and conduits.

1.02 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. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- C. Samples: Submit two paper chip samples, 2 x 2 inch (50 x 50 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Samples: Submit two painted samples, illustrating selected colors for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 8 1/2 x 11 inch (216 x 279 mm) in size.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning

instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.04 MAINTENANCE MATERIALS

- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.06 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Locate where directed by Architect.
- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Benjamin Moore & Co.: www.benjaminmoore.com.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated in Color Schedule.
 - 1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including roof mounted equipment.
 - 1. Two top coats and one coat primer.
 - 2. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint CE-OP-3A - Concrete/Masonry, Opaque, Acrylic, 3 Coat:
 - 1. One coat of block filler.
 - 2. Satin: Two coats of elastomeric.
- C. Paint ME-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of latex primer.
 - 2. Semi-gloss: Two coats of latex enamel.
- D. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
 - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 - 2. Semi-gloss: Two coats of latex enamel.
- E. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. One coat galvanize primer.
 - 2. Semi-gloss: Two coats of latex enamel.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.
- G. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- F. Sand metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Final Acceptance.

END OF SECTION

This page intentionally left blank

**SECTION 09 91 23
INTERIOR PAINTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Glass.
 - 9. Concealed pipes, ducts, and conduits.

1.02 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 D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- E. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
 - 4. Manufacturer's installation instructions.
- C. Samples: Submit two paper chip samples, 2 x 2 inch (50 x 50 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Samples: Submit two painted samples, illustrating selected colors for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 8 1/2 x 11 inch (216 x 279 mm) in size.
- E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures.

- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.04 MAINTENANCE MATERIALS

- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum of three years of documented experience.

1.06 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Locate where directed by Architect.
- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
1. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.
 2. Benjamin Moore & Co.: www.benjaminmoore.com.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - a. Basis of Design

- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors:
 - 1. Selection to be made by Architect after award of contract.
 - 2. Allow for minimum of ten colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, and shop primed steel.
 - 1. Two top coats and one coat primer.
 - 2. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 - 1. Medium duty applications include doors and door frames.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat(s): High Performance Architectural Interior Latex.
 - 4. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
 - 5. Primer: As recommended by top coat manufacturer for specific substrate.
- C. Paint I-OP-MD-WC - Medium Duty Overhead: Including gypsum board, uncoated steel, shop primed steel, and galvanized steel.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): High Performance Architectural Interior Latex.
 - 3. Top Coat Sheen:

- a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces and for all painted finishes in the Welding Shop.
- 4. Primer: As recommended by top coat manufacturer for specific substrate.
- D. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 - 1. Shop primer by others.
 - 2. One top coat; white.
 - 3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
- E. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of latex primer.
 - 2. Semi-gloss: Two coats of latex enamel.
- F. Paint MGI-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. One coat galvanize primer.
 - 2. Semi-gloss: Two coats of latex enamel.
- G. Paint CI-OP-3E - Concrete/Masonry, Epoxy Enamel, 3 Coat:
 - 1. One coat of catalyzed epoxy primer.
 - 2. Semi-Gloss: Two coats of catalyzed epoxy enamel.
- H. Paint GI-OP-3A - Gypsum Board/Plaster, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer sealer.
 - 2. Semi-gloss: Two coats of industrial alkyd urethane.
 - 3. Locations: All toilet room gypsum board walls.
- I. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
 - 1. One coat of alkyd primer sealer.
 - 2. Flat: Two coats of latex enamel.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 - 1. General Storage rooms 617 and 618 are existing rooms that were previously used for coal storage and coal fired boiler rooms. Coal residue is on all surfaces and must be thoroughly cleaned and prepared by methods recommended by the manufacturer. Minimum requirements include:
 - a. Thorough cleaning.
 - b. Application of stain kill primer.
 - c. Application of block filler.
 - d. Application of epoxy paint.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- I. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 93 00
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of transparent finishes.

1.02 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. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category.
 - 2. Manufacturer's installation instructions.
- C. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.
- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Stain and Transparent Finish Materials: 1 gallon (4 L) of each color and type; from the same product run, store where directed.
 - 3. Label each container with color and type in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.
- B. Provide finishes from the same manufacturer.
- C. Transparent Finishes:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 4. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide stains and transparent finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood - Trim:
 - 1. Sealer: Water-Based, Sanding Sealer, Clear.
 - 2. Top Coat(s): Clear Water-Based Varnish; MPI #128, 129, or 130.
 - 3. Top Coat Sheen:
 - a. Satin: MPI gloss level 4; use this sheen at all locations.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.
- B. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin application of stains and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- F. Reinstall items removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

This page intentionally left blank

**SECTION 10 14 00
SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Luminous egress path marking and other "glow-in-the-dark" signs.
- D. Dimensional letter signs.
- E. Building street number.
- F. Plaque.
- G. County seal.

1.02 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.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Shop Drawings: Submit shop drawings listing sign size, letter form and letter heights.
- D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. 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.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- E. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- G. Verification Samples: Submit samples showing colors specified.
- H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- I. Manufacturer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 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 tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Flat Signs:
 - 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 2. FASTSIGNS: www.fastsigns.com/#sle.
 - 3. Inpro: www.inprocorp.com/#sle.
 - a. Boston Basis of Design or approved substitution.
 - 4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
 - 5. Seton Identification Products: www.seton.com/aec.
 - 6. ASI Sign Systems, Inc: www.asisignage.com.
 - 7. Gemini, Inc.: www.geminisigns.com.
 - 8. Avalis Wayfinding Solutions: www.avalisway.com.
 - 9. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Dimensional Letter Signs:
 - 1. FASTSIGNS: www.fastsigns.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Mohawk Sign Systems, Inc: www.mohawksign.com.
 - 4. Gemini Incorporated: www.geminisigns.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Plaques:
 - 1. Artistic Bronze: www.artisticbronze.net.
 - 2. Franklin Bronze Plaques: www.franklinbronzeplaques.com.
 - 3. Gemini Incorporated: www.geminisignproducts.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS - FLAT

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with bonded panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
 - 3. Copy Position: As indicated on drawings.
 - 4. Sign Height: As necessary for compliance with ANSI/ICC A 117.1 Chapter 7.
 - 5. Classroom and Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section for replaceable occupant name.
 - a. View window: Two line.
 - 6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
 - 7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN" room numbers to be determined later, and braille.

- a. 8" x 10" with a gender symbol and the verbal description placed directly below followed by Grade 2 braille.

2.03 INTERIOR DIRECTIONAL AND INFORMATIONAL SIGNS

- A. Sign Type: Same as room and door signs.
- B. Wording of signs is scheduled on drawings.
- C. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.
- D. Luminous Egress Path Marking and Other "Glow-in-the-Dark" Signs: Photoluminescent media.

2.04 BUILDING IDENTIFICATION SIGNS

- A. Use individual metal letters.
- B. Mount on outside wall in location indicated on drawings.

2.05 BUILDING STREET NUMBER

- A. Use individual die cut vinyl numbers.
 - 1. Size: 10 inches.
 - 2. Color: As selected by Architect from manufacturer's full range.
- B. Content: As directed by owner.
- C. Location: As directed by owner.

2.06 SIGN TYPES - FLAT

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
 - 4. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
 - 5. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: As selected by Architect from manufacturer's full range.
 - 4. Character Color: Contrasting color, to be selected from manufacturer's full range.

2.07 TACTILE SIGNAGE MEDIA

- A. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
 - 1. Total Thickness: 1/8 inch (3 mm).
 - 2. Panel Edges: Square.
 - 3. Panel Corners: Square.
 - 4. Mounting: Tape Adhesive.
 - 5. Application: Tactile "EXIT" signs at each exit door.

2.08 PLAQUES

- A. Metal Plaques:
 - 1. Metal: Bronze casting.
 - 2. Metal Thickness: 1/8 inch (3 mm), minimum.
 - 3. Size: As indicated on drawings.
 - 4. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.

- c. Character Color: Contrast with background color.
- 5. Border Style: As indicated on drawings.
- 6. Background Texture: Leatherette.
- 7. Surface Finish: Brushed, satin.
- 8. Painted Background Color: Black.
- 9. Protective Coating: Manufacturer's standard clear coating.
- 10. Manufacturer: International Bronze Plaque Company (Basis of Design or approved substitution).
- 11. Mounting: Blind studs.
- B. County Seal:
 - 1. Manufacturer: International Bronze Plaque Company (Basis of Design).
 - 2. Material: Cast bronze.
 - 3. Size: Varies - as indicated on plans.
 - 4. Border: Custom.
 - 5. Letter Style: Custom.
 - 6. Mounting Method: Concealed mounting.
 - 7. Background Color: Custom.
 - 8. Content: Custom as indicated on plans.

2.09 DIMENSIONAL LETTERS

- A. Metal Letters:
 - 1. Metal: Aluminum casting.
 - 2. Metal Thickness: 2 inch minimum (50 mm).
 - 3. Letter Height: As indicated on drawings.
 - 4. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.
 - 5. Finish: Baked enamel.
 - a. Color: To be selected by Architect from manufacturer's full range.
 - 6. Product: ASI Series LF Light Weight Fabricated Metal Dimensional Letters Basis of Design or approved substitution.
 - 7. Mounting: Projected stud.
 - 8. Content: As indicated on plans.

2.10 PHOTOLUMINESCENT MEDIA

- A. Elevator Signs: Acrylic photoluminescent square.
 - 1. Symbol: As indicated on drawings.
 - 2. Size: As indicated on drawings.
 - 3. Mounting: Peel-and-stick.

2.11 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.03 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- B. Remove temporary coverings and protection to adjacent work areas.
- C. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet.

END OF SECTION

This page intentionally left blank

**SECTION 10 14 16
PLAQUES**

PART 2 PRODUCTS

1.01 PLAQUES

END OF SECTION

This page intentionally left blank

**SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE**

PART 2 PRODUCTS

1.01 DIMENSIONAL LETTERS

1.02 ACCESSORIES

END OF SECTION

This page intentionally left blank

SECTION 10 21 13.17
PHENOLIC TOILET COMPARTMENTS - ASI ACCURATE/GLOBAL

This page intentionally left blank

**SECTION 10 22 13
WIRE MESH PARTITIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wire mesh systems for walls.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- C. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2025.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for mesh materials, finishes.
- C. Shop Drawings: Indicate plan and vertical dimensions, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.
- D. Samples: Submit two, 12 by 12 inch (300 by 300 mm) in size, illustrating mesh material style, color, and finish.
- E. Samples: Finish color samples for selection.
- F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Wire Mesh Partitions:
 - 1. WireCrafters, LLC: www.wirecrafters.com.
 - a. Basis of Design or approved substitution.
 - 2. Miller Wire Works, Inc: www.millerwireworks.com/#sle.
 - 3. Spaceguard Products: www.spaceguardproducts.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WIRE MESH PARTITIONS

- A. Wire Mesh Partitions: Factory-fabricated modular assemblies of panels, doors, anchors, hardware, and accessories as required to provide a complete system.
 - 1. Design Criteria:
 - a. Design partition system to provide for movement of components without damage, undue stress on fasteners or other detrimental effects, when subject to design loads.
 - b. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 2. Style: Full mesh.
 - 3. Post Spacing: As required to suit dimensions, using manufacturer's standard panel widths.
 - 4. Provide special panels of same construction as adjacent panels to achieve horizontal partition dimensions indicated.

5. Panel frames bolted together and to posts.
6. Height: 8'-5 1/4".
7. Toe Space: 3 1/4" below bottom panel.
8. Ceiling Panels: Full enclosure.
 - a. Same as wall panels; provide supplemental support where required by span.

2.03 COMPONENTS

- A. Woven Wire Mesh: Standard duty.
 1. Material: ASTM A510/A510M uncoated crimped steel wire.
 2. Wire Size: 10 gauge, 0.135 inch (3.5 mm).
 3. Mesh Opening Size: 2"x1".
- B. Framing and Support Members:
 1. Material: ASTM A36/A36M steel shapes and ASTM A500/A500M cold-formed steel tubing.
 2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.
 3. Vertical Stiffeners: As required for partitions greater than 144 inches (3658 mm) in height.
- C. Doors: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing operation.
 1. Width: 36 inches.
 2. Height: Manufacturer's standard.
 3. Locking: Mortise type cylinder locks, keyed on outside, operated by recessed turn knob inside.
- D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.04 FASTENERS

- A. Bolts, Nuts and Washers: Hot dip galvanized.
- B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

2.05 ACCESSORIES

- A. Bracing: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.
- B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.
- C. Post Caps: Manufacturer's standard.
- D. Floor Pilaster Shoe: Manufacturer's standard.
- E. Floor Base: Manufacturer's standard.

2.06 FABRICATION

- A. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- B. Make exposed joints flush or tight.

2.07 FINISHES

- A. Painted Finish: Manufacturer's standard powder coat finish.
 1. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that substrate surfaces and required openings are ready to receive work.

3.02 PREPARATION

- A. Clean substrate surfaces.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install items plumb and level, accurately fitted, free from distortion or defects.

3.04 TOLERANCES

- A. Maximum Variation From Plumb or Level: 1/4 inch (6 mm).
- B. Maximum Misalignment From True Position: 1/4 inch (6 mm).

3.05 ADJUSTING

- A. Adjust doors to achieve free movement.

3.06 CLEANING

- A. Remove temporary protection to prefinished surfaces.

END OF SECTION

This page intentionally left blank

**SECTION 10 26 41
BALLISTICS RESISTANT PANELS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Laminated fiberglass ballistics-resistant panels.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's current data sheets on each product to be used.
- C. Shop Drawings: Details of installation of ballistics-resistant panels, including plan views, elevations, sections, and details of the proposed installation with attachment methods.
- D. Samples: Submit two samples, minimum size 6 inches by 6 inches (150 mm by 150 mm), for each product specified.
- E. Certificates: Submit printed data to indicate compliance with following requirements.
 - 1. UL Listing verification and UL 752 Current Test Results as provided by Underwriters Laboratories.
- F. Manufacturer's Instructions: Indicate preparation and installation.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name, manufacturer's identification, and required UL certification labels until ready for installation.
- B. Handle material with care to prevent damage. Stack panels flat, store inside under cover off the ground in a dry location, and protect from other construction activities.

1.07 FIELD CONDITIONS

- A. Install products under environmental conditions (temperature, humidity, and ventilation) recommended by manufacturer.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide ten year manufacturer warranty for materials and workmanship against defects commencing on the Date of Substantial Completion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Laminated Glass Fiber Ballistics-Resistant Panels:
 - 1. Armortex: www.armortex.com/#sle.
 - 2. Insulgard Security Products: www.insulgard.com/#sle.

3. Total Security Solutions: www.tssbulletproof.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LAMINATED FIBER BALLISTICS-RESISTANT PANELS

- A. General:
 1. Laminated fiber ballistics-resistant panels to be non-ricochet type. When struck by a bullet or projectile, the panels to delaminate in such a way that absorbs the energy, stops the projectile, and prevents ricochet or spalling.
 2. Ballistics Resistance of Joints: Equal to that of the panel.
- B. Performance Requirements:
 1. Ballistics Resistance Rating: Listed and labeled as tested in accordance with UL 752 Level 2 (high-power handgun) threat rating.
 2. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when tested in accordance with ASTM E84.
- C. Laminated Fiber Panels:
 1. Material: Multiple layers of fiberglass woven roving bonded together with resin and compressed into flat rigid sheets.
 2. Panel Size: 4 ft by 8 ft (1219 mm by 2438 mm).
 3. Panel Size: Maximum size to limit number of seams.
 4. Panel Thickness: 1/2 inch (12 mm) minimum.
 5. Panel Weight: Minimum weight required for selected UL 752 threat level.
 6. Attachment Method: Mechanical fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation of this work.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install panels in accordance with manufacturer's instructions and shop drawings and in proper relationship with adjacent construction.
 1. Maintain ballistics-resistive rating at panel junctures with concrete floor and roof slabs, bullet-resistive door and window frames, and required penetrations.
- B. Reinforce panel joints with a minimum 4 inch (102 mm) wide back-up layer of ballistics-resistant material, centered on panel joints.
- C. Secure panels using screws.

3.04 PROTECTION

- A. Protect installed panels from subsequent construction operations.

END OF SECTION

**SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Institutional ligature-resistant toilet accessories.
- D. Under-lavatory pipe supply covers.
- E. Electric hand/hair dryers.
- F. Diaper changing stations.
- G. Utility room accessories.

1.02 REFERENCE STANDARDS

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.
- F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. ASI - American Specialties, Inc: www.americanspecialties.com.
 - a. Basis of Design or approved substitution.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Bobrick: www.bobrick.com.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Electric Hand Dryers
 - 1. Dyson Airblade: www.dysonairblade.com.
 - a. Model Airblade V Basis of Design or approved substitution.
 - 2. World Dryer: www.worlddryer.com.
 - 3. Saniflow Corporation: www.saniflowcorp.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

- C. Diaper Changing Stations:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation: www.bradleycorp.com/#sle.
 - 3. Koala Kare Products: www.koalabear.com/#sle.
 - 4. Substitutions: 01 60 00 - Product Requirements.
- D. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide two keys for each key operated accessory to Architect .
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- G. Adhesive: Two component epoxy type, waterproof.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser - TD: Jumbo roll, surface mounted.
 - 1. Cover: Stainless steel.
 - 2. Capacity: 10 inch roll.
 - 3. Product: ASI 0042 manufactured by ASI or approved substitution.
- B. Paper Towel Dispenser - PT: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
 - 1. Capacity: 400 minimum.
 - 2. Product: 0210 manufactured by ASI or approved substitution.
- C. Soap Dispenser - VSD: Liquid soap dispenser, deck-mounted on vanity, with polyethylene container concealed below deck; piston and 4 inch (100 mm) spout of stainless steel with bright polished finish; chrome-plated deck escutcheon.
 - 1. Minimum Capacity: 34 ounces (1.0 liter).
 - 2. Product: 03347 manufactured by ASI or approved substitution.
- D. Soap Dispenser - SD: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and vertical stainless steel tank and working parts; push type soap valve, check valve, and window gage refill indicator, tumbler lock.
 - 1. Minimum Capacity: 40 ounces (1.2 liters).
 - 2. Product: 0347 manufactured by ASI or approved substitution.
- E. Mirrors - M: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
 - 1. Size: As indicated on drawings.
 - 2. Product: 20650 manufactured by ASI or approved substitution.

- F. Grab Bars - GB: Stainless steel, peened surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Product: 3800-P manufactured by ASI or approved substitution.

2.05 INSTITUTIONAL SECURITY AND LIGATURE-RESISTANT TOILET AND BATH ACCESSORIES

- A. Grab Bars DE-2/DE-3: Type 304 stainless steel, smooth surface with closure plate.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar; 14 gauge stainless steel "L" shaped closure plate with wall mounting flange welded to bottom of tube to prevent ligature. Install grab bar and closure plate with tamper-resistant screws through grab bar circular mounting flange and wall flange of flat closure.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Product: Security Series manufactured by ASI or approved substitution.

2.06 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Robe Hook - H: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Product: 7340-S manufactured by ASI or approved substitution.

2.07 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hand Dryers - HD: Traditional fan-in-case type, with downward fixed nozzle.
 - 1. Operation: Automatic, sensor-operated on and off.
 - a. Hand dry time: 12 seconds.
 - b. Airspeed at nozzle: 420 mph.
 - c. Operating Airflow: Up to 5.28 gal/sec.
 - d. Rated Operating Noise Power: 79 db(A).
 - 2. Mounting: Surface mounted.
 - 3. Cover: Polycarbonate with anti-microbial additive.
 - a. Color: Sprayed nickel.
 - b. Tamper-resistant screw attachment of cover to mounting plate.
 - 4. Product: Dyson Airblade V Basis of Design or approved substitution.

2.08 DIAPER CHANGING STATIONS

- A. Diaper Changing Station - CS: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Stainless steel.
 - 2. Mounting: Recessed.
 - 3. Product: 9018 manufactured by ASI or approved substitution.

2.09 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder - MS: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
 - 1. Hooks: Four, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
 - 2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 - 3. Length: 36 inches (900 mm).
 - 4. Product: 1308-3 as manufactured by ASI or approved substitution.

5. Installation: One in each janitors room.
 - a. Coordinate location with owner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
- D. Mounting Heights and Locations: As required by accessibility regulations

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

**SECTION 10 44 00
FIRE PROTECTION SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.
- D. Fire Department Key Lock Box.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- B. FM (AG) - FM Approval Guide; current edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers; 2017, with Errata (2018).
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, 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 and cabinet physical dimensions.
- 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. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Nystrom, Inc: www.nystrom.com.
 - 4. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
 - 5. JL Industries, Inc. : www.jlindustries.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 4. Nystrom, Inc: www.nystrom.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. 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.

- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Stored Pressure Operated: Deep Drawn.
 - 2. Class: A:B:C type.
 - 3. Size: 10 pound (4.54 kg).
 - 4. Finish: Baked polyester powder coat, color as selected.
 - 5. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.
- C. Fire Rated Cabinet Construction: One-hour fire rated.
 - 1. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.
- D. Configuration: Semi-recessed rolled edge.
 - 1. Projection: 3 1/2 inches.
 - 2. Sized to accommodate extinguisher and accessories.
- E. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge.
 - 1. Style: Full panel.
 - 2. Opening: 180 degree.
 - 3. Handle: Polished chrome.
 - 4. Catch: Roller.
 - 5. Lock: None.
 - 6. Lettering: Red vertical, "Fire Extinguisher".
- F. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.
- G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- H. Fabrication: Weld, fill, and grind components smooth.
- I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- J. Finish of Cabinet Interior: White colored enamel.
- K. Product - FEC: Larsen's Manufacturing Company "Architectural Series" or approved substitution.
- L. Product - FED (DE-6): Larsen's Manufacturing Company "Detention Architectural Series Cabinet" or approved substitution.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.
- B. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

2.05 FIRE DEPARTMENT LOCK BOX

- A. Fire Department Lock Box - Basis of Design: 3200 series Knox-Box by Know Company or approved substitution.
- B. Fire Department Lock Box: Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
 - 1. Capacity: Holds 2 keys.
 - 2. Finish: Manufacturer's standard dark bronze.
 - 3. Door: Weather resistant gasket.
 - 4. Options:
 - a. Tamper alarm switch, UL Listed.

- b. Recessed mounting kit.
 - c. Inside switch.
- C. Manufacturers - Fire Department Lock Box:
 - 1. Knox Company; Knox-Box Rapid Entry System: www.knoxbox.com.
 - 2. Kidde: www.kidde.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Location: Coordinate with Owner and Fire Marshal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install plumb and level in wall openings, inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

This page intentionally left blank

**SECTION 10 75 00
FLAGPOLES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum Flagpoles.

1.02 REFERENCE STANDARDS

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2016.
- 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. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pole, accessories, and configurations.
- C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.
- D. Samples: Submit finish samples for each finished metal used on flagpoles.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- C. Obtain each flagpole as a complete unit from a single source.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. American Flagpole: www.americanflagpole.com/#sle.
- B. Concord American Flagpole: www.concordamericanflagpole.com.
 - 1. Product: Continental Series ESR - Ground Set Basis of Design or approved substitution.
- C. Pole-Tech Co., Inc: www.poletech.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001
 - 1. Material: Aluminum.
 - 2. Design: Cone tapered.
 - 3. Mounting: Ground mounted type.
 - 4. Nominal Height: 30 ft (9 m); measured from nominal ground elevation.

5. Halyard: External type 5/16" (#10) polypropylene.
 6. Halyard Flag Snaps: Provide two (2) stainless steel swivel snap hooks with neoprene covers.
 7. Cleat(s): Provide one (1) heavy-duty cast aluminum cleat (9") with 1/4"-20NC flat head stainless steel self tapping screws.
 8. Flash Collar: Provide Spun Aluminum Collar to match flagpole.
 9. Quantity: One, see civil plans for location.
- B. Performance Requirements:
1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 150 miles/hr (241 km/hr) wind speed, in accordance with NAAMM FP 1001.

2.03 POLE MATERIALS

- A. Aluminum: Seamless, extruded tubing complying with ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
1. Aluminum to have a tensile strength not less than 30,000 psi with a yield point of 25,000 psi. Heat treat after fabrication to comply with ASTM B 597, temper T6.

2.04 ACCESSORIES

- A. Flagpole Lighting:
1. Product: American Beacon - External Halyard Series Basis of Design or approved substitution.
 2. Bulbs: LED.
 3. Ball Diameter: 8 inches.
 4. Finish: Gold anodized.
 5. Voltage: 110 volts.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Flag: Owner to select flag design, 72 by 120 inch (1,829 by 3,048 mm) size, premium nylon fabric, brass grommets, hemmed edges.
1. UV protected.
 2. Embroidered.
 3. Lock stitched reinforced seams.
- D. Cleats: 9 inch (230 mm) size, aluminum with stainless steel fastenings, two per halyard.
- E. Halyard: 5/16 inch (8 mm) diameter polypropylene, braided, white.

2.05 MOUNTING COMPONENTS

- A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage (1.5 mm) steel, galvanized, depth per manufacturer's indicated.
- B. Pole Base Attachment: Flush; steel base with base cover.
- C. Lightning Ground Rod: 3/4 inch (19mm) diameter copper rod.
1. Length: Per flagpole manufacturer.

2.06 FINISHING

- A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
- B. Aluminum: Mill finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

- A. Install flagpole , base assembly, and fittings in accordance with manufacturer's instructions.
- B. Electrically ground flagpole installation.
- C. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/2 inch (12 mm).

3.05 ADJUSTING

- A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

This page intentionally left blank

SECTION 10 82 13
EXTERIOR GRILLES AND SCREENS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Stand-alone roof equipment screens and supporting steel framework attached to the roof structure.
- B. Roof screen aluminum louvers.
- C. Roof screen accessories.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- 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 A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- E. 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; 2024.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- G. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2020.
- H. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2021.
- I. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).
- J. ASTM D4811/D4811M - Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing; 2016 (Reapproved 2023).
- K. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2019.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- N. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.
 - 1. Include field dimensions of openings and elevations on shop drawings.
 - 2. Indicate distinction between factory-assembled and field-assembled work on shop drawings.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: Submit two samples for color verification, 10 inches (254 mm) by 10 inches (254 mm) minimum.

- E. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- F. Designer's Qualification Statement.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Perform structural design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.
- B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.
- C. Handle materials in conformance with the manufacturers printed instructions.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a one year period after Date of Substantial Completion.
- C. Framing System:
 - 1. Provide manufacturer's standard written limited warranty stating that the complete framing system shall be warranted against structural failure due to cracking, buckling, bending, tearing or corrosion arising under normal use and environmental conditions for the coverage period applicable.
 - 2. Twenty (20) years.
- D. Louver Finish:
 - 1. Provide written warranty stating that the paint finish applied on all equipment enclosure louvers will be warranted against chipping, peeling, cracking, fading, or blistering for the coverage period of twenty (20) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. RoofScreen Mfg.: www.roofscreen.com.
 - 1. Basis of Design or approved substitution.
- B. Architectural Grilles & Sunshades, Inc: www.agsshade.com/#sle.
- C. Construction Specialties, Inc: www.c-sgroup.com/#sle.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Design Loads: Comply with Building Code for site location and building height.
 - 1. Design to resist ASCE 7 - Minimum Design Loads for Buildings and Other Structures, using the latest published ASCE version.
 - 2. Design all materials, assembly and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.

- B. Structural Design:
 - 1. Prepare structural design calculations for screen framing and attachment to structure including reactions at base supports for verification of roof structure by Structural Engineer.
 - 2. Prepare structural design calculations for louver assemblies including blades, clips, trees, fasteners, and attachment to structure.
 - a. Design and provide louvers to withstand project wind loads with a deflection in both vertical and horizontal members not to exceed $L/180$.
- C. All welds to be performed by an AWS certified welder. Valid certification to be provided.
- D. Thermal Movement: Normal thermal movement is defined as that resulting from a 120 degrees F maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
- E. Anchors, connections, and assemblies connecting all components and associated fabrications to the supporting construction are shown on the Drawings for graphic purposes only. The louver manufacturer/installer is responsible for the structural design and placement of the connections and anchors, including all connecting hardware, accessories and reinforcing necessary for fabrication, and installation of the louvers and associated fabrications.
- F. The louver manufacturer is to include all locations of connections and anchors in the shop drawings.
- G. The Architect's review of shop drawings is not to be construed as removing responsibility from the louver manufacturer/installer for structural failures related to design, fabrication, installation, and fabrication services.

2.03 MATERIALS

- A. Framing:
 - 1. Basis-of-Design Manufacturer: RoofScreen Mfg. or approved substitution.
 - a. Product: RotoLock.
 - 2. Square Base Supports: Weldments fabricated from cold rolled steel conforming to ASTM A 1008, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil baked on powder coat primer.
 - a. Height: Custom - varies with roof slope.
 - b. Square Base Support Extensions: Fabricated from same material and finish as base supports.
 - 3. Square Base Cap: Weldments fabricated from AISI Type 304 stainless steel with mill finish and fabricated to overlap base support and flashing boot a minimum of 2 inches (51 mm). Provide moment resisting adjustable connection to attach framing to base cap.
 - 4. Square TPO Roof Flashing: Fabricated from 60 mil, white, single ply TPO sheet conforming to ASTM D 6878. Provide with base flange that extends a minimum of 5 inches (127 mm) onto the roof surface on all four sides. Riser shall be tapered to allow easy fit over Square Base Supports with minimal gap at top of flashing. Hot weld all seams for water tightness.
 - 5. Base Cap Gasket: EPDM with self-adhesive closed cell foam.
 - 6. Framing: Carbon steel structural tubing in manufacturer's standard sizes, conforming to ASTM A 500 with manufacturer's standard galvanized coating conforming to ASTM A 1057. Provide with wall thickness as determined by structural calculations.
 - 7. Connector Fittings: Fabricated from AISI Type 304 stainless steel with mill finish.
 - 8. Steel Z section: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
 - 9. Steel Hat Channel: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
 - 10. Hardware: Bolts, nuts and washers: 18-8 stainless steel.
 - 11. Self-Drilling Screws: Carbon steel with factory applied protective coating conforming to ASTM B 117 salt spray testing.
 - 12. Welding Materials: AWS D1.1; type required for materials being welded.
- B. Louvers:
 - 1. Basis-of-Design Manufacturer and Louver: RoofScreen Mfg. or approved substitution.

- a. Product: VisionGuard L10 Angled Louver.
2. Aluminum Extrusions: ASTM B 221, 6063-T6 alloy and temper.
3. Fasteners:
 - a. Provide exposed fasteners of stainless steel or carbon steel with factory applied protective coating, with finish color coating to match the finish on aluminum.
 - b. Provide fasteners not exposed to view of stainless steel or carbon steel with factory applied protective coating.

2.04 FABRICATION

- A. Framing:
 1. Shop fabricate grilles and screens to the greatest extent possible.
 2. Disassemble as necessary for shipping and handling, clearly mark units for proper reassembly.
 3. Provide supports, anchorages, and accessories as required for complete assembled system.
 4. Fabricate items with joints tightly fitted and secured.
 5. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
 7. Fabricate system components so that portions of screen can be dismantled for repairs to equipment being screened and for future roof replacement.
 8. Trim and Closures: Fabricated from 24 gauge metal and finished with the manufacturer's standard coating system.
- B. Louvers:
 1. Fabricate louvers with close-fitting, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework and with supporting members and hardware concealed from front edges of blades so blades have continuous appearance.
 2. General:
 - a. Fabricate all units to produce uniform sight lines and to be level, plumb and in same plane as adjacent panels.
 - b. Accurately fabricate all joints for proper fit.
 - c. Protect exposed surfaces against damage from scratches and discoloration.
 3. Louvers:
 - a. Fabricate continuous blade louvers from minimum 0.1-inch-thick extruded aluminum to shapes and configurations shown on the Drawings.
 - b. Provide support clips from minimum 0.125-inch-thick extruded aluminum to comply with specified performance criteria and manufacturer's fabrication procedures and standards.
 - c. Provide vertical supports ("trees") from minimum 3 inch by 3 inch by 0.188-inch-thick extruded aluminum angles to comply with specified performance criteria and manufacturer's fabrication procedures and standards, at spacings not further apart than recommended by manufacturer.
 4. Corners:
 - a. Provide inside and outside corners fabricated from 6 inch by 6 inch by 0.100-inch-thick aluminum trim, painted to match louver blades, to be fastened with exposed fasteners.
 5. Provide all accessories and materials for fabrication, assembly and installation required to provide a complete and warranted louver installation.

2.05 FINISHES

- A. Aluminum/Louvers:
 1. Provide all louver members and accessories free of scratches and serious blemishes affecting the finish system.
 2. Fluoropolymer Paint Finish: Factory finish all louver members, trims, and mitered corners with thermoset fluoropolymer paint system in accordance with the manufacturer's printed

requirements and performance specifications and the AAMA specification Ref. AAMA 2605 for Superior Performance Organic Coatings on Aluminum Extrusions and Panels.

- B. Finish Color: As selected by Architect from manufacturer's full color range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that painting, roofing, and other adjacent work that might damage screen finish have been completed prior to start of installation.
- C. Examine area where work will be installed to verify the installation can be performed in accordance with the Drawings and structural calculation requirements without interference from other equipment or trades.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Do not begin installation until conditions have been properly prepared.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written installation instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.
- D. Anchor fabrications to structure as indicated.
- E. Separate dissimilar metals and use gasketed fasteners, isolation shim, or isolation tape to eliminate possibility of corrosive or electrolytic action between metals.
- F. Exercise care when installing components so as not to damage finish surfaces. Touch up as required to repair damaged finishes.
- G. Install flashing boots at base supports as required to provide a watertight connection. Install as recommended by the roof membrane manufacturer.
- H. Remove all protective masking from material immediately after installation.
- I. Set all items in their correct locations as shown on the final reviewed shop drawings, level, square, plumb and at proper elevations and in alignment with other work.
- J. Assemble and anchor the various components to allow for expansion and contraction, maintaining a watertight installation.

3.03 CLEANING

- A. Remove temporary protective covering immediately after installation.
- B. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.
- C. Touch-up damaged finish coating using material provided by manufacturer to match original coating.
- D. Replace louvers and framing members that have been damaged beyond touch-up or similar minor repair procedures.

3.04 PROTECTION

- A. Protect installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION

This page intentionally left blank

**SECTION 12 21 13
HORIZONTAL LOUVER BLINDS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.02 REFERENCE STANDARDS

- A. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 01.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- D. Samples: Submit two samples, 6 inch long illustrating slat materials and finish, color, cord type and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 PROJECT CONDITIONS

- A. Coordinate the work with window installation and placement of concealed blocking to support blinds.
- B. Take field measurements to determine sizes required.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Horizontal Louver Blinds Without Side Guides:
 - 1. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
 - 2. Levolor Contract: www.levolorcontract.com.
 - 3. SWFcontract, a division of Spring Window Fashions, LLC.: www.swfcontract.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BLINDS WITHOUT SIDE GUIDES

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
- C. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
 - 1. Width: 1 inch (25 mm).
 - 2. Thickness: 0.006 inch (0.15 mm).
 - 3. Color: As selected from manufacturer's full range.
- D. Slat Support: Woven polypropylene cord, ladder configuration.
- E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.

- F. Bottom Rail: Pre-finished, formed steel; with end caps.
 - 1. Color: Same as headrail.
- G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
 - 1. Free end weighted.
- H. Control Wand: Extruded hollow plastic; hexagonal shape.
 - 1. Removable type.
 - 2. Length of window opening height less 3 inch (76 mm).
 - 3. Color: As selected by Architect from manufacturer's full range.
- I. Headrail Attachment: Wall brackets.
- J. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

- A. Determine sizes by field measurement.
- B. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch (6.25 mm).
- C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch (6.25 mm) between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed. See Section 06 10 01.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with concealed fasteners.
- C. Install at all exterior windows/storefronts unless specifically noted otherwise.

3.03 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).
- B. Maximum Offset From Level: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy.

END OF SECTION

**SECTION 12 24 00
WINDOW SHADES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior motorized roller shades.
- B. Motor controls.

1.02 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015 (Reapproved 2021)e1.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
 - 2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- C. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
 - 1. Motorized Shades: Include power requirements and standard wiring diagrams for specified products.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
 - 1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
- D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
- E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- F. Selection Samples: Include fabric samples in full range of available colors and patterns.
 - 1. Motorized Shades: Include finish selections for controls.
- G. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.
- H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.
- J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

- K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.
 - 1. Manufacturer's authorized representative.
 - 2. Factory training and demonstrated experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Electric Motors: One year.
 - 3. Electronic Control Equipment: One year.
 - 4. Fabric: One year.
 - 5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Motorized Roller Shades, Motors and Motor Controls:
 - 1. Draper, Inc; Motorized FlexShade: www.draperinc.com/#sle.
 - a. Basis of Design or approved substitution.
 - 2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
 - 3. Levolor: www.levolor.com/commercial/#sle.
 - 4. Lutron Electronics Co., Inc: www.lutron.com/#sle.
 - 5. MechoShade Systems LLC: www.mechoshade.com/#sle.
 - 6. SWFcontract, a division of Springs Window Fashions, LLC: www.swfcontract.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Interior Roller Shades - Basis of Design: Draper, Inc; Motorized FlexShade AC: www.draperinc.com/#sle.
 - 1. Description: Single roller, motor-operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
 - a. Mounting: Window jamb mounted - inside, between jambs.
 - b. Fabric: As indicated under Shade Fabric article.
 - 2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.

3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
 - a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize double-sided adhesive tape.
 - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
 - a. Style: Exposed hembar; aluminum rectangular hembar with plastic end caps.
5. Shade Motor: Intelligent (RS485) quiet 120V AC motor (sound level of 38 dBA or less), located on right side facing window from inside (standard).
6. Intelligent RS485 Motor:
 - a. Supports bidirectional network communication with individual unique address; capable of storing 16 configurable group addresses for group control.
 - b. Capable of alignment within accuracy of plus/minus 0.8 inch (2 mm).
 - c. Supports positioning from 0 to 100 percent in 0.5 percent increments and 16 customizable stop points.
7. Accessories:
 - a. Light Gap Reduction Channels: Provide extruded aluminum channels to reduce light leakage at sides of shades.
 - b. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; clear anodized finish.
 - c. Exposed Headbox: Extruded aluminum, size as required to conceal shade mounting; clear anodized finish.
 - d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

- A. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 1. Manufacturers:
 - a. MechoShade Systems LLC: www.mechoshade.com/#sle.
 - b. Mermet Corporation: www.mermetusa.com/#sle.
 - c. Phifer, Inc: www.phifer.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Material: Polyester with acrylic backing.
 3. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 - b. Fungal Resistance: No growth when tested according to ASTM G21.
 4. Openness Factor: 0%.
 5. Weight: 11.65 ounces per square yard (395 grams per square meter).
 6. Color: As selected by Architect from manufacturer's full range of colors.

2.04 MOTOR CONTROLS

- A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- B. Provide all components and connections necessary to interface with other systems as indicated.
- C. Digital Network Controls:
 1. Intelligent Motors and Devices: Identifiable over network without separate interface.
 2. Provide suitable interface modules as indicated or as required for connection to standard (nonintelligent) motors and devices.

3. Capable of reprogrammed control without requiring wiring modifications.
 4. Capable of assigning shade motors to shade groups/sub-groups.
 5. Capable of storing programmable open and close limits and minimum of three intermediate preset stop positions for each shade.
 6. Capable of aligning adjacent shades within accuracy of plus/minus 0.25 inch (6.4 mm).
 7. Provide 10 year nonvolatile power failure memory for system configuration settings.
- D. Manual Controls:
1. Control Functions:
 - a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
 - b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
 2. Wall Controls: Provided by shade manufacturer.
 - a. Finish: To be selected by Architect.

2.05 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

- A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.
- D. Training: Train Owner's personnel on operation and maintenance of system.
 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.07 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

This page intentionally left blank

**SECTION 12 36 00
COUNTERTOPS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Countertops for architectural cabinet work.
- B. Granite countertops for casework.
 - 1. Granite side and back splashes.

1.02 REFERENCE STANDARDS

- A. ASTM C615 / C615M - 11 Standard Specification for Granite Dimension Stone.
- B. AWI (QCP) - Quality Certification Program; Current Edition.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- G. PS 1 - Structural Plywood; 2023.
- H. SEFA 3 - Laboratory Work Surfaces; 2020.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, texture, patterns, markings and surface finish.
 - 1. Sample of sealant.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Fabricator/Installer Qualifications: Company with experience in the fabrication and installation of work specified in this section with a minimum of five years of documented experience.
 - 1. Granite Fabricator:
 - a. Experience with wet fabrication techniques and has a shop capable of cutting and polishing granite in compliance with MIA Standards.

1.05 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.

1.06 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS**2.01 COUNTERTOPS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Quality Standard: SEFA 3 for laboratory worksurfaces.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 3/4 inch (19 mm), minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont; _____: www.corian.com/#sle.
 - 2) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
 - 3) Wilsonart; _____: www.wilsonart.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As selected by Architect from manufacturer's full line.
 - 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 - 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
 - 5. Skirts: Same sheet material.
 - 6. Fabricate in accordance with manufacturer's standard requirements.
- D. Natural Stone Countertops: Stone slabs bonded to substrate; use as large pieces as possible with inconspicuous adhesive joints.
 - 1. Stone: Granite without cracks, voids, or pin holes .
 - a. ASTM C615.
 - 2. Grade: Architectural.
 - 3. Dimensions: As indicated on plans.
 - 4. Stone Thickness: 1-1/4 inch (3 mm), minimum.
 - 5. Surface Finish: Honed, non-glare.
 - 6. Custom Edge Detail:
 - a. Double pencil round.
 - 7. Back and End Splashes: Same material, same thickness; for field attachment.
 - a. Thickness: 3/8" (9.5 mm).
 - b. Height: 4" (101 mm).

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches (102 mm), unless otherwise indicated.
 3. Corner Conditions: Mitered.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Granite - Comply with the requirements of the following reference standards:
 1. NBGQA's "Standard Specifications for Architectural Granite."
 2. Marble Institute of America's "Dimension Stone Design Manual."
- E. Cut edges, corners, intersections, openings square, true, and straight unless otherwise indicated.
- F. Layout:
 1. Field verify dimension before fabricating components.
 2. Layout work to minimize the number of seams.
 3. Do not locate seams at large openings, such as sinks.
- G. Counter - Granite:
 1. Sink Mount: Under-mount.
 2. Cutouts: Coordinate size and location with other trades and comply with sink manufacturer's product specifications.
 - a. Accurately locate and size cutouts.
 - b. Polish edges of cutouts.
 3. Corner Condition: No joint in corner.
- H. Seams: Bonded, Polyester resin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. General - Granite:
 1. Install items specified in this section according to countertop manufacturer's instructions and in compliance with the installation requirements of the following referenced standards:
 - a. MIA's "Dimension Stone Design Manual" Chapters 13 & 17.
 - b. NBGQA's "Standard Specifications for Architectural Granite"
 - c. Architectural Woodwork Standards, Section 11, Subparagraph 6.2.5 for installation of epoxy resin, natural/manufactured stone as published by AWI, WI, and AWMAC.
 2. Do not field cut stone unless otherwise indicated.
 3. "Dry assemble" pieces to verify fit before applying adhesives.
 4. Shim pieces as required to produce surfaces that are plumb, level, flush, aligned, and true.
 5. Apply adhesives only after final adjustments and corrections to fit have been made.

6. Seal joint between back/end splashes and vertical surfaces.
7. Countertop:
 - a. Install countertop to plywood substrate and/or cabinet framing with adhesive.
 - b. Apply adhesive to seams and draw panels tight.
8. Loose Splashes:
 - a. Mask seams to prevent adhesive from smearing.
 - b. Install splashes units to countertop and wall surface with adhesive.
 - c. Align seams between splash units and countertop panels.
 - d. Join splash units in same fashion as countertop panels.

3.04 CLEANING

- A. Clean countertops surfaces thoroughly.
- B. Clean according to manufacturer's instructions, but not less than the following:
 1. Wash with clean, water suitable for drinking and neutral (pH 7), soapless cleaner approved by countertop manufacturer.
 2. Leave no streaks, smears, or stains.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.
- C. Repair scratches and scars according to manufacturer's instructions.
- D. Provide protection according to countertop manufacturer's instructions, but not less than the following:
 1. Sealer: Apply according to sealer manufacturer's instructions.
 2. Protective Covering: Cover granite surfaces with nonstaining kraft paper, clean fabric tarp, or 6 mil plastic film.
 - a. Remove protective covering at Final Completion.

END OF SECTION

**SECTION 12 55 00
DETENTION FURNISHINGS AND ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Detention furnishings and accessories as indicated on the drawings and as specified below.

1.02 REFERENCE STANDARDS

- A. ASTM - American Society for Testing and Materials.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate product description, including compliance with specified requirements and installation requirements. Mark manufacturer's brochures to include only those products proposed for use.
- C. Submit shop drawings detailing fabrication and erection of equipment to be provided.
 - 1. Include plans, elevations, sections, and details of equipment and connections.
 - 2. Show anchorage and any accessory items.
 - 3. Provide templates for anchors and bolts specified for installation.
- D. Manufacturers Installation Instructions: Include attachment requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
- B. Fabricator Qualifications: Company specializing in fabricating products specified in this section, with at least five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- D. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Receive, unload and store all products and materials.
- C. Store products at site to prevent damage or loss until installation is made.
- D. Handle materials to prevent damage to surfaces, edges, and ends of sheet metal items. Reject and remove damaged material from site.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer warranty against defects in materials and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Majestic Solutions: www.majesticsolutionsinc.net.
- B. Norix Furniture: www.norix.com.
- C. Jails Corrections Products: www.fabcor.com.
- D. Viking Products: www.vikingfab.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Floor Mounted Bench: DE-1
 - 1. Size: 72" L x 12" W x 18" H.
 - 2. Construction:
 - a. Seat Top: 12 gauge 304 #4 polished reinforced stainless steel.
 - b. Pedestals: Two 2 3/8" O.D. schedule 40 stainless steel.
 - c. Base Plates: Two stainless steel with four 1/2" diameter holes for expansion bolts.
 - d. Handcuff Bar: 1 1/2" diameter stainless steel integrated handcuff bar welded to bench front.
- B. Modesty Screen: DE-4
 - 1. Size: 48" H x 48" W x 12" floor to bottom clearance.
 - 2. Construction:
 - a. Body Panel: 12 gauge 304 #4 polished stainless steel with edges ground smooth.
 - b. Top/Side Tubing: Reinforced stainless steel.
 - c. Bottom Frame: Stainless steel tube.
 - d. Wall Mounting Bracket: Continuous stainless steel.
 - e. Floor Mount Plate: 1/4" thick stainless steel with four 1/2" diameter holes for expansion bolts.
- C. Wall Mounted Shelf: DE-5
 - 1. Size: 60" L x 12" W.
 - 2. Construction:
 - a. One piece 12 gauge 304 #4 polished stainless steel including support gussets and wall mounting brackets.
- D. Pistol Locker
 - 1. Size: Six compartment tilt-out - 6" deep.
 - 2. Construction:
 - a. Material: 12 gauge steel.
 - b. Each Compartment:
 - 1) Liner: 1/8" felt.
 - 2) Hinge: Continuous.
 - 3) Lock: Snap locks, each compartment individually keyed and master-keyed.
 - c. Provide compartment/key labels and numbers per owner's direction and requirements.
 - 3. Provide anchorage devices and security fasteners for complete installation.
 - 4. Finish: Assembly shall be provided with one (1) shop coat of primer and powder coat.
 - a. Color as selected by Architect from manufacturer's full range.
 - 5. Product: PL23-6TC by Majestic Solutions basis of design or approved substitution.

2.03 ACCESSORIES

- A. Fasteners:
 - 1. Type and quantity per manufacturer - provided by installer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Verify that conditions are acceptable for product installation in accordance with manufacturer's instructions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.

3.03 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

3.04 PROTECTION

- A. Protect accessories from damage until date of Substantial Completion. Replace accessories which become damaged.

END OF SECTION

This page intentionally left blank

**SECTION 12 67 00
PEWS AND BENCHES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wood benches.
- B. Accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance of affected installers.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, bench layouts and dimensions.
 - 1. Field Measurements: Verify bench layout by field measurements and record field dimensions on shop drawings.
- D. Selection Samples: Manufacturer's color charts and swatches for hardwood and finishes, indicating full range of materials, colors, and patterns available.
- E. Verification Samples: Actual sample of selected hardwood representing color and finish.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified with a minimum of three years of documented experience and factory trained by manufacturer.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide a twenty-five year manufacturer warranty against defects in materials and workmanship.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Bench manufacturer shall coordinate delivery with contractor to prevent any storage or handling of product by contractor prior to assembly and installation.
- B. Bench manufacturer shall be responsible for all delivery, unloading, assembly, and installation of benches.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Sauder Manufacturing Co.: www.sauder.com.
 - 1. Basis of Design or approved substitution.
- B. Kivetts: www.kivetts.com.
- C. New Holland Church Furniture: www.newhollandwood.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Provide all Benches and components by one manufacturer.

2.02 MATERIALS

- A. Bench: 301-4116 by Sauder Basis of Design or approved substitution.
 - 1. Back: Flat panel of 5-ply construction, with a core of nominally 1/2" plywood, two plys crossband of 1/8" hardboard (64.2 lb density), with one ply premium wood species on both faces.

2. Back Cap: 5/4 premium wood species in required lengths.
 - a. Cap shall be attached using a hydraulic press using assembly glue and a press fit joint, and shall have an under-cap support molding for added strength.
 3. Seat: 5-ply construction, shaped to body contour. Core material shall be nominally 1/2" plywood, with two ply crossband of 1/8" hardboard (64.2 lb density), with one ply premium wood species on top faces, and continuous balance sheet of bottom face.
 - a. An integral solid lumber edge band shall be laminated into the 5-ply seat for screw-holding at back-to-seat joint.
 4. Length: Varies - As indicated on the drawings.
- B. Intermediate supports shall extend full height of the bench back to the cap, and shall be 1 1/2" thick.
1. Finish: Wood species to match bench.
- C. Bench Ends: 302-2200 by Sauder Basis of Design or approved substitution.
1. Veneer edge banding not allowed.
- D. Wood species: Maple.

2.03 ACCESSORIES

- A. Concealed anchors and fasteners per manufacturer.

2.04 FINISHES

- A. Manufacturer's standard stain, sealer, and top coat.
1. Formaldehyde free.
 2. Color: As selected by Architect from manufacturer's full range.
 3. Sheen: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of benches. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's installation instructions and approved shop drawings.

END OF SECTION

**SECTION 14 21 00
ELECTRIC TRACTION ELEVATORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electric traction elevator systems.
 - 1. Security type.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).
- C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.
- D. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.
- E. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.
- H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- I. 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; 2024.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- M. ITS (DIR) - Directory of Listed Products; Current Edition.
- N. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- O. NEMA MG 00001 - Motors and Generators; 2024.
- P. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- S. PS 1 - Structural Plywood; 2023.
- T. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other installers to provide necessary conduits for proper installation of wiring, including but not limited to the following:
 - a. Elevator pit for lighting and sump pump.
- B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.

1. Review schedule of installation, proper procedures and conditions, and coordination with related work.
 2. Review use of elevator for construction purposes, hours of use, scheduling of use, cleanliness of car, employment of operator, and maintenance of system.
- C. Construction Use of Elevator: Not permitted.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit data on following items:
1. Signal and operating fixtures, operating panels, and indicators.
 2. Car design, dimensions, layout, and components.
 3. Car and hoistway door and frame details.
 4. Electrical characteristics and connection requirements.
- C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 2. Hoistway Components: Size and location of car machine beams, guide rails, buffers, ropes, and other components.
 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 4. Loads on hoisting beams.
 5. Clearances and over-travel of car and counterweight.
 6. Locations in hoistway of traveling cables and connections for car lighting and telephone.
 7. Location and sizes of hoistway and car doors and frames.
 8. Calculated heat dissipation of elevator equipment.
 9. Electrical characteristics and connection requirements.
 10. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- D. Samples: Submit samples illustrating car floor material, car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.
- E. Operation and Maintenance Data:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 2. Operation and maintenance manual.
- F. Specimen warranty.
- G. Executed warranty.
1. Schematic drawings of equipment and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design guide rails under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

- E. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- A. Manufacturer Warranty: Provide 1-year manufacturer warranty for elevator operating equipment and devices. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Electric Traction Elevators:
 - 1. Otis Elevator Company: www.otis.com/#sle.
 - a. Gen3 Edge Basis of Design or approved substitution.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Source Limitations: Provide elevator and associated equipment and components produced by the same manufacturer as the other elevator equipment used for this project and obtained from a single supplier.

2.02 ELECTRIC TRACTION ELEVATORS

- A. Electric Traction Passenger Elevator, No. 1, 2, 3:
 - 1. Equipment Description: Compact Gearless Machine with Machine-Room Less application
 - 2. Quantity of Elevators: 1
 - 3. Elevator Stop Designations: 1,2,3
 - 4. Stops : 3
 - 5. Openings: 3 at Front, 0 at Rear.
 - 6. Travel: 34 ft 0 in 0
 - 7. Rated Capacity: 3500 lbs
 - 8. Rated Speed: 200 fpm
 - 9. Platform Size: 6' 6-3/4" wide x 6' 1-1/8" deep
 - 10. Clear Inside Dimensions: 6' 5 9/16" x 5' 5 9/16"
 - 11. Cab Height: 9' 9"
 - 12. Entrance Height: 8' 0"
 - 13. Main Power Supply: 480 Volts, 3-Phase, 60Hz + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.
 - 14. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
 - 15. Machine and Controller Location: Located in door jamb on highest level.
 - 16. Signal Fixtures: Manufacturer's standard with stainless steel metal button targets (exc. CA).
 - 17. Controller Location: Inside hoistway, accessible by a door in the side hoistway wall on the 1st landing as indicated on the plans.
 - 18. Stopping Accuracy: $\pm 1/4"$ (6.4 mm) under any loading condition or direction of travel.
 - 19. Operation: Simplex Collective Operation- Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 - 20. Operating Features – Standard:
 - 21. Operation Features – Optional [if !supportLineBreakNewLine]
 - 22. Door Control Features: [if !supportLineBreakNewLine]
 - 23. Provide equipment according to seismic zone: Zone 0
- B. Electric Traction Security Elevator, No. 4:
 - 1. Equipment Description: Compact Gearless Machine with Machine-Room Less application
 - 2. Quantity of Elevators: 1

3. Elevator Stop Designations: 3
4. Stops : 3
5. Openings: 1 at Front at first floor, 2 at Rear at second and third floor.
6. Travel: 34 ft 0 in 0
7. Rated Capacity: 3000 lbs
8. Rated Speed: 150 fpm
9. Platform Size: 6' 6-3/4" wide x 6' 8-3/16" deep
10. Clear Inside Dimensions: 6' 5 9/16" x 5' 6 1/8"
11. Cab Height: 7' 9"
12. Clear Cab Height: 7'-9" with 5/16" floor recess and Structural ceiling
13. Entrance Type and Width: Entrance Type and Width: Single Slide; 3' 6"
14. Entrance Height: 7' 0"
15. Main Power Supply: 480 Volts, 3-Phase, 60Hz + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.
16. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
17. Machine and Controller Location: No machine-room required, tank and controller in hoistway pit.
18. Signal Fixtures: Manufacturer's standard with stainless steel metal button targets (exc. CA).
19. Controller Location: Inside hoistway, accessible by a door in the side hoistway wall on the 1st landing as indicated on the plans.
20. Stopping Accuracy: $\pm 1/4"$ (6.4 mm) under any loading condition or direction of travel.
21. Operation: Simplex Collective Operation- Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
22. Operating Features - Standard
 - a. Full Collective Operation
 - b. Anti-nuisance.
 - c. Fan and Light Protection.
 - d. Load Weighing Bypass.
 - e. Independent Service.
 - f. Full Collective Operation.
 - g. Firefighters' Service Phase I and Phase II.
 - h. Top of Car Inspection.
23. Operation Features – Optional
 - a. Emergency Rescue Unit
 - b. Automatic Standby Power Operation with Manual Override.
24. Door Control Features: [if !supportLineBreakNewLine]
 - a. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call. [if !supportLineBreakNewLine]
 - b. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. [if !supportLineBreakNewLine]
 - c. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time. [if !supportLineBreakNewLine]
25. Provide equipment according to seismic zone: Zone 0

2.03 COMPONENTS

- A. Elevator Equipment:
 1. Motors, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70 requirements.
 2. Guide Rails, Cables, Counterweights, Sheaves, Buffers, Attachment Brackets, and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.

- 3. Buffers:
 - a. Spring type for elevators with speed less than or equal to 200 feet per minute (1 m per second).
- 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.
 - b. Grease Cups: Automatic feed type.
 - c. Lubrication Points: Visible and easily accessible.
- B. Electrical Equipment:
 - 1. Motors: NEMA MG 1.
 - 2. Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 requirements.
 - 3. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
 - 4. Include wiring and connections to elevator devices remote from hoistway and between elevator machine room. Provide additional components and wiring to suit machine room layout. See Section 26 05 83.

2.04 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Comply with ADA Standards.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
- D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- E. Perform welding of steel in accordance with AWS D1.1/D1.1M.
- F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and complying with requirements of authorities having jurisdiction (AHJ).
- G. Perform electrical work in accordance with NFPA 70.
- H. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ).

2.05 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels and landing indicator panels.
 - 1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 - 2. Landing Indicator Panels: Illuminating.
 - 3. Comply with ADA Standards for elevator controls.
- B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.
- C. Door Operation Controls:
 - 1. Program door control to open doors automatically when car arrives at floor landing.
 - 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 - 3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.
- D. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
 - 1. Designated Landing: Main Lobby.

2.06 OPERATION CONTROL TYPE

- A. Single Automatic (Push Button) Operation Control: Applies to car in single elevator shaft.
 - 1. Refer to description provided in ASME A17.1.

2. Set system operation so that momentary pressure of landing button dispatches car from other landing to that landing.
3. Allow call registered by momentary pressure of landing button at any time to remain registered until car stops in response to that landing call.
4. If elevator car door is not opened within predetermined period of time after car has stopped at terminal landing, allow car to respond to call registered from other landing.

2.07 SERVICE CONTROL TYPE

- A. Restricted Access Service Control:
 1. Keyed Lobby Lock-Out: Provide a key operated switch in car operating panel that performs the following when activated:
 - a. Cancels registered car calls.
 - b. When activated, no new car calls will be registered, except at landing where lock-out feature is located.
 - c. Restricts car calls registered to specific floors only, except the main access floor and those floors enabled by lock-out switches.
 - d. Landing calls are answered in normal manner.
 2. Car Call Lock-Out: Provide a key-operated switch with key removable from "On" or "Off" position in car operating panel that performs the following when activated:
 - a. Restricts or permits registration of a specific landing button.
 - b. Landing calls are answered in normal manner.
 3. Landing Call Lock-Out: Provide a key-operated switch with key removable from "On" or "Off" position in landing control station that performs the following when activated:
 - a. Restricts or permits landing call registration for that landing.
 - b. Causes the elevator to not respond to that landing.
 4. Allow "Firefighter's Emergency Operation" to take control priority over "Restricted Access Service Control."

2.08 EMERGENCY POWER

- A. Set up elevator operation to run with building emergency power supply when the normal building power supply fails and in compliance with ASME A17.1 requirements.
- B. Building Emergency Power Supply: Supplied by backup generator; provide elevator system components as required for emergency power characteristics with phase rotation the same as for normal power.
 1. Provide transfer switches and auxiliary contacts.
 2. Install connections to power feeders.
- C. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.
- D. Provide operational control circuitry for adapting the change from normal to emergency power.
- E. Upon transfer to emergency power, advance one elevator at a time to a preselected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

- A. Rolled Steel Sections, Shapes, Rods: ASTM A36/A36M.
- B. Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel), with matte finish.
- C. Stainless Steel Sheet: ASTM A666, Type 304; No. 4 Brushed finish unless otherwise indicated.
- D. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
- E. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.
- F. Plywood: PS 1, Structural I, Grade C-D or better, sanded.
- G. Plastic Laminate: NEMA LD 3, Type HGS, color as selected by Architect from manufacturer's standard line of colors.

2.10 CAR AND HOISTWAY ENTRANCES

- A. Elevator, No. 1, 2, 3, & 4:
 - 1. Car and Hoistway Entrances:
 - a. Hoistway Fire Rating: 1 Hour.
 - b. Elevator Door Fire Rating: 1 Hour.
 - c. Framed Opening Finish and Material: Brushed stainless steel.
 - d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
 - e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
 - f. Door Type: Double leaf.
 - g. Door Operation: Side opening, two speed.
 - h. Sills: Extruded aluminum.
- B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.
- C. Gasketing: Provide acoustic-type gasketing at hoistway doors and frames to eliminate audible noise due to car activities in the hoistway and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car:
 - 1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, and alarm button.
 - a. Panel Material: Integral with front return; one per car.
 - b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch (1372 mm) above car finished floor.
 - d. Provide convenience outlet receptacle; 110VAC, 15 amps, locate below service cabinet.
 - 2. Ventilation: Single-speed fan with grille in ceiling.
 - 3. Wall Base: Recessed stainless steel, 4 inch (102 mm) high.
 - 4. Front Return Panel: Match material of car door.
 - 5. Door Wall: Plastic laminate on plywood.
 - 6. Walls
 - a. Elevator 1 and 3: Plastic laminate on plywood.
 - b. Elevator 2: Stainless steel.
 - 7. Ceiling:
 - a. Elevator 1 and 3:
 - 1) Dropped steel ceiling with 6 LED lights in a brushed steel finish.
 - b. Elevator 2:
 - 1) Flush steel ceiling with 4 LED lights in a brushed steel finish.

2.12 FINISHES

- A. Powder Coat on Steel: Clean and degrease metal surface; apply one coat of primer; two coats of powder coat.
- B. Baked Enamel on Steel: Clean and degrease metal surface; apply one coat of primer sprayed and baked; two coats of enamel sprayed and baked.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway and pit are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.02 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components. See Section 01 50 00 - Temporary Facilities and Controls for additional requirements.
- B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

- A. Coordinate this work with installation of hoistway wall construction.
- B. Install system components, and connect equipment to building utilities.
- C. Provide conduit, electrical boxes, wiring, and accessories; see Sections 26 05 33.13 and 26 05 83.
- D. Mount machines and motors on vibration and acoustic isolators.
 - 1. Place on structural supports and bearing plates.
 - 2. Securely fasten to building supports.
 - 3. Prevent lateral displacement.
- E. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- F. Install guide rails to allow for expansion and contraction movement of guide rails.
- G. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- H. Bolt brackets to self drilling expansion shell anchors.
- I. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- J. Structural Metal Surfaces: Clean surfaces of rust, oil, or grease; wipe clean with solvent; prime with two coats.
- K. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- L. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Testing and inspection performed at discretion of regulatory agencies certified in accordance with ASME QEI 1.
 - 1. Schedule tests with agencies and notify Owner and Architect.
 - 2. Obtain permits as required to perform tests.
 - 3. Document regulatory agency tests and inspections in accordance with requirements.
 - 4. Perform tests required by regulatory agencies.
 - 5. Furnish test and approval certificates issued by authorities having jurisdiction (AHJ).
- C. Perform testing and inspection in accordance with requirements.
 - 1. Inspectors shall be certified in accordance with ASME QEI-1.
 - 2. Perform tests in accordance with ASME A17.2.
 - 3. Provide at least two weeks written notice of date and time of tests and inspections.
- D. Operational Tests:
 - 1. Perform operational tests in the presence of Owner and Architect.
 - 2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
 - a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch (6.4 mm) maximum from flush with sill.

3.07 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove protective coverings from finished surfaces.
- C. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, cleaning, and maintenance of each component.
- E. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3.09 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch up, repair, or replace damaged products and materials before Date of Substantial Completion.

END OF SECTION

This page intentionally left blank

A. GENERAL

1. SCOPE OF WORK

- a. The Sprinkler Contractor shall be licensed for sprinkler work.
- b. The Sprinkler Contractor shall provide all materials and labor necessary to install a complete and operating sprinkler system in accordance with the Engineering Drawings and as specified herein.

2. Quality Assurance

- a. All work shall be in accordance with State Building Codes, National Fire Protection Association and all applicable codes.
- b. The Notice to Bidders, Instructions to Bidders, General Conditions, and Supplementary General Conditions are a part of these specifications.
- c. Any inspection and test charges required for the sprinkler work by approving authorities and Owners and any permits needed for installation of a complete system shall be secured and paid for by the Sprinkler Contractor.
- d. Where the words "Approved", "Approval", or "Approved Equivalent" appear, it is intended that items other than the model number specified shall be subject to approval of the Engineer.
- e. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall require and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- f. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer ten (10) days before the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required. Items that are submitted for approval after this date will not be accepted.
- g. The Sprinkler Contractor shall refer to the General Conditions for provisions of temporary utilities required under this Contract.
- h. All work shall be performed in accordance with U. S. Department of Labor, Occupational Safety and Health Standards.
- i. The entire system will be accepted as a unit. There will be no partial acceptance.
- j. The Owner shall provide heat in the building to protect the wet pipe system after acceptance of the system and provide all fire extinguishers.

3. Submittals

- a. See General and Supplementary General Conditions.

- b. Within ten days after notification of the award of contract and written notice to begin work the Contractor shall submit to the Architect/Engineer for approval, a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Four sets of submittal data shall be provided for approval.
 - c. Each submittal shall bear the approval of the Contractor indicating he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.
 - d. Shop drawings and data sheets shall provide all pertinent information for proper evaluation of each item. The drawings are diagrammatic only and are not intended to show minor details and exact locations. Locations of pipes, ducts, electrical raceways, panels, equipment, light fixtures, ceiling diffusers, etc., shall be reviewed, and anticipated interferences shall be coordinated with other Prime Contractors prior to installation. Lines, whose elevation cannot be changed, shall have the right- of-way, and larger lines shall have the right-of-way over smaller lines. Shop drawings shall show all principal dimensions, "tie-in" dimensions, sizes and locations.
 - e. The Contractor shall submit to the Engineer a set of accurately marked plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these As-Built Plans.
 - f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data and sufficient manufacturer's literature to operate and maintain all equipment.
 - g. The Contractor shall submit to the Owner all certificates required for operating system in compliance with state and federal regulations.
4. Product Delivery, Storage and Handling
- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner. Designated areas for material storage will be established by the Owner, and each Contractor will be responsible for maintaining his own area.
 - b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
 - c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.
5. Work Conditions and Coordination
- a. The Contractor shall review the plans of all other Prime Contractors on the job and inform them of anticipated areas of conflict prior to installation of fire protection system.

- b. The Contractor shall review the electrical requirements for the equipment provided and establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrical contracting firm.
- c. The Contractor will be responsible for the final electrical connections to all equipment installed as part of his contract. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Electrical Contractor.
- d. Electrical work by this Contractor shall be in accordance with all state and national codes, and as specified in Division 16 contained herein.
- e. Pipe sleeves and chases required for the installation of a complete fire protection system shall be furnished by this Contractor, and he shall be responsible for coordinating the location and correct number of all required openings. The Contractor will be responsible to the General Contractor for coordinating this work with his schedule and will not cause him any undue hardship or loss of time.
- f. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

6. Guarantee

- a. Contractor will provide extent and length of warranty and guarantee for all products with his submittals. If no warranties are available or offered, it shall be understood that the Contractor shall guarantee and warrant all materials and labor done under his contract for 12 months from the date of acceptance.
- b. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.

B. PRODUCT

- 1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core.
- 3. All materials, products and equipment and components thereof which make up a complete fire protection system, shall be such as appear on the Fire Underwriters Equipment List of the Underwriters Laboratories, Inc.

C. EXECUTION

- 1. Inspection

- a. This Contractor shall examine all areas of completed work prior to installation of the fire protection systems and insure that no defects or errors are present which would result in the poor application or installation of subsequent work.
- b. It is the responsibility of this Contractor to coordinate all work performed by others for this Contractor. Upon inspection, should errors or omissions be found, it will be the responsibility of this Contractor to resolve the problem at no cost to the Owner.

2. Installation

- a. All work shall be performed in a manner indicating proficiency in the trade.
- b. All pipes, conduit, etc., shall be either parallel to the building walls or plumb where installed in a vertical position, unless otherwise noted, and shall be concealed when located in architecturally finished areas.
- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- e. This Contractor shall familiarize himself with the method and schedule of installation of poured concrete floors and walls. He shall lay out his work in advance and furnish all sleeves and opening locations to the General Contractor for installation. This Contractor shall provide and install all inserts and hangers required to support his equipment, pipes, conduit, etc.
- f. All piping and conduit shall be accurately roughed in according to manufacturer's installation dimensions so that no offset adaptors, flexible connections or other imprecision not required by the manufacturer are necessary. All incorrect work shall be torn out and corrected and walls and floors patched at no expense to the Owner.
- g. Items such as alarms, valves, test connections, drains, etc., shall be accessible for operating, servicing, maintaining and repairing. Those which are installed in unsuitable locations shall be relocated as directed by the Architect/Engineer at no cost to the Owner.
- h. Connections to water, soil and waste lines shall be made at locations shown on the drawings.

3. Performance

- a. This Contractor shall perform all excavation and backfill operations necessary for installation of his work.

4. Erection

- a. All support steel, angles, channels, pipes or structural steel studs and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided and installed by this Contractor, unless otherwise noted.

5. Field Quality Control

a. Testing and Flushing

- i. Upon completion of work, inspection and tests shall be made by the Contractor's representative and witnessed by an Owner's representative. All defects shall be corrected and system left in service before a final certificate is issued. The NFPA Contractor's Material and Test Certificate shall be completed and signed by both representatives. Copies shall be prepared for approving authorities, Owner and Contractor.
- ii. The entire fire protection system, including yard piping, shall be hydrostatically tested at not less than 200 pounds per square inch pressure for two hours or at 50 pounds per square inch in excess of the maximum static pressure when the maximum static pressure is in excess of 150 pounds. The hydrostatic test pressure shall be measured at the low point of the individual system or zone being tested.
- iii. The inside sprinkler piping shall be installed in such a manner that there will be no visible leakage when the system is subjected to the hydrostatic pressure test.
- iv. The yard piping test shall be made before the joints are covered in order that any leaks may be readily detected. Leakage shall not exceed 2 quarts per hour per 100 joints. It is important to backfill the trench between joints before testing to prevent movement of pipe. The yard piping shall be flushed before connecting to the internal sprinkler system.
- v. Instruments, specialties and equipment subject to damage shall be isolated during tests.
- vi. Prior to final acceptance, each control valve shall be closed and opened under pressure, to insure proper operation.
- vii. Test of drainage facilities shall be made while the control valve is wide open. The main drain valve shall be opened and remain open until the system pressure stabilizes.
- viii. Final report forms shall be prepared, delivered to and approval obtained from local authorities, IRI, and any other agency having approval authority and delivered to the Owner. Contractor's Certificate covering materials and tests shall be prepared and delivered to the Owner.

END OF SECTION 210500

THIS PAGE IS INTENTIONALLY LEFT BLANK

A. GENERAL

1. This Contractor shall be responsible for the final electrical and the entire control system and control connections to all equipment installed as part of his contract.
2. Wiring from panelboard circuit breakers, etc. up to disconnect switch shall be by the electrical contractor. Wiring from disconnect through equipment and final electrical connections to mechanical equipment shall be by this contractor.
3. All power and control wiring shall be in conduits.
4. All electrical work shall be performed by a licensed electrician.
5. All electrical work shall be in accordance with the State Building Code and all its supplements and the latest edition of the National Electrical Code.

B. PRODUCT

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
3. All conductors and conduits shall be sized as noted on the plans or as required per NEC.

C. EXECUTION

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
2. Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid- Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 210513

THIS PAGE IS INTENTIONALLY LEFT BLANK

A. GENERAL

1. The Sprinkler Contractor shall provide all materials and labor for the installation and make operational a complete sprinkler system.
2. The sprinkler system shall meet all NFPA Standards and approval by governing authorities, and all other authorities having approval jurisdiction shall be received prior to and after installation.
3. All materials shall be new, and all materials, products and equipment and components thereof shall be such as appear on the Fire Underwriters' Equipment List of the Underwriters' Laboratories, Inc.
4. The Contractor shall provide the Owner with instruction charts describing operation and proper maintenance of sprinkler devices, and a copy of the publication, NFPA No. 13A, latest edition, entitled "Care and Maintenance of Sprinkler Systems".
5. Before asking final approval of automatic sprinkler equipment by the authorities have jurisdiction, the Contractor shall furnish a written statement to the effect that the work covered by his Contract has been completed and tested in accordance with the approved specifications and drawings.
6. See Section 21 05 00, Item C, EXECUTION, Paragraph 5, Field Quality Control for Acceptance Tests Requirements.
7. Testing of all piping shall be made in the presence of the Engineer or designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.

B. PRODUCT

1. Piping
 - a. Piping 2 1/2" and larger shall be schedule 10, and piping 2 " and smaller shall be schedule 40, steel pipe conforming to ASTM Specification A795. Other type piping may be submitted for approval only if listed, and it meets the standards cited in NFPA.
 - b. Standard weight welding fittings shall be used and shall conform to ANSI B16.11.
 - c. Screwed fittings shall be malleable iron, 150 pounds s.w.p. with banded pattern conforming to ANSI B16.3.
 - d. Standard riser plate signage shall be provided on each system riser.
 - e. Dry pipe shall be internally galvanized steel pipe
 - f. Grooved end fittings shall be ductile iron and conform to ASTM A536, Grade 65-45-12. Short-pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
 - g. Grooved Joint Couplings: Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12, with pressure-responsive elastomer gasket conforming to ASTM D-2000, and zinc-electroplated carbon steel bolts and nuts conforming to ASTM A-449 and ASTM A-183. Couplings shall comply with ASTM F1476.
 - i. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Victaulic Style 009H and 107H/107N (Quick-Vic™). Installation ready rigid coupling for direct stab installation without field disassembly.

1. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess type couplings, which require the use of a torque wrench to achieve the exact required gap between housings, are not permitted.
 - ii. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Installation-Ready Style 177 or Style 77.
2. Hangers and Supports
 - a. Inserts set in concrete shall be coordinated with the General Contractor. See Specification Section 21 05 29.
 - b. Hangers shall be furnished and installed by the Sprinkler Contractor. See Specification Section 21 05 29.
3. Sprinkler Heads
 - a. Only listed sprinkler heads shall be used. Sprinkler heads shall not be altered in any respect, nor have any type of ornamentation or coatings applied after shipment from the place of manufacture.
 - b. Guards shall be furnished wherever heads will be subject to damage.
 - c. The Contractor shall provide the Owner a cabinet containing a minimum of 6 spare sprinklers of each type used in the installation. A special sprinkler wrench shall also be provided to be used in the removal and installation of sprinklers. Mount cabinet adjacent to riser.
 - d. Where possible, all sprinkler heads shall be trimmed with materials to allow ceiling tile replacement.
4. Sprinkler Alarms
 - a. Alarm check valve of the approved type with water motor alarm gong, riser trim, drain valves and riser lines shall be located at the main system control valve as indicated on the Drawings.
 - b. Water flow switches are to be furnished and installed by the Sprinkler Contractor.
 - c. Wiring from flow switches and alarm valves to fire alarm control panel shall be by Electrical Contractor.
5. Gauges
 - a. Approved pressure gauges shall be installed as indicated on the Drawings. The gauge connection shall be equipped with a shut-off valve and with provision for draining.
 - b. The pressure gauges shall be of approved type and shall have a maximum limit not less than twice the normal working pressure at the point where installed. They shall be installed to permit removal and shall be located where they will not be subject to freezing.
6. Valves
 - a. Shut-off valves shall be Jenkins Figure 825-A, or approved equivalent by Crane or Nibco.
 - b. Check valves shall be Jenkins Figure 629, or approved equivalent by Crane or Nibco.

- c. Inspector's Test Valve: Provide inspector's test valve and piping as shown on the Drawings.
- d. Standard design identification signs shall be provided on all control drain, test and alarm valves.

C. EXECUTION

1. Pipe 2" and smaller shall have screwed joints.
2. Pipe 2 1/2" and larger shall be welded or grooved joint fittings. Welding of pipe shall be in accordance with NFPA 13, Chapter 3-3.12.4.
3. Welding ties or weldolets shall be used.
4. No "stub-in" shall be permitted.
5. Screwed unions shall not be used on pipe larger than 2". Couplings and unions of other than screwed type shall be of types approved specifically for use in the sprinkler systems.
6. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
7. A one-piece reducing fitting shall be used wherever a change is made in the size of the pipe, except hexagonal or face bushings may be used in reducing the size of the openings of fittings when standard fittings of the required size are not available.
8. Hangers supporting horizontal piping shall be installed and spaced in accordance with NFPA 13, Chapter 3-3.14.
9. Sleeves shall be provided wherever pipes pass through walls, floors, and ceilings. Sleeves shall be schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through wall and ceiling shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight. Pipes passing through sleeves shall be painted with a rust inhibiting paint. Pipes passing through fire walls or floors shall be sealed to conform to Underwriters' Laboratories requirements.
10. Installation of hangers and inserts shall be coordinated with all other Contractors on a priority basis. Each Contractor shall be responsible for providing all inserts, hangers, and rods necessary for the installation of his work.
11. Spacing, location and position of sprinkler heads and piping are approved on plans and shall be in accordance with minimum standards set forth in NFPA 13, Chapter 3.
12. All sprinkler heads, unless otherwise noted, will be centered in ceiling tiles.
13. All sprinkler heads, unless otherwise noted, will be installed on a swing connection.

14. All piping tests for the sprinkler system shall be in accordance with NFPA 13, Chapter 1-1.11.3. A Contractor's Material and Test Certificate Part "C" will be filled out for each riser by the Contractor and signed with copies prepared for approving authorities, Owner, and Architect/Engineer. Any leaks that occur shall be repaired and another test started. All defects shall be corrected and the system left in service before the Contractor leaves the job.
15. All exposed piping shall be painted Safety Red. In finished spaces the color may will be dictated by architectural plans.

END OF SECTION 210523

A. GENERAL

1. This Section includes hangers and supports, etc. as may be required to provide a complete sprinkler piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

B. PRODUCT

1. Piping shall be as stated in Section 21 05 23.
2. Hangers and Supports shall be as follows:

Concrete Inserts	Fig. B2500
Hanger Rod	Fig. B3205
Riser Clamp	Fig. B3373
Clevis Hanger	Fig. B3100
Pipe Saddles	Fig. B3160
Rod Ceiling Plate	Fig. B3199
Beam Clamps	Fig. B-3033

Figure numbers given above are devices as manufactured by Eaton, Inc. Equals by Erico, Viking or Anvil are acceptable.

C. EXECUTION

1. Hangers supporting horizontal piping shall be spaced in accordance with NFPA 13.
2. Hangers shall be provided at each change in direction. Vertical risers shall be supported at each floor, 5 feet on center and/or at changes in direction of pipe.
3. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be schedule 40, black steel, 1/2" diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.

END OF SECTION 210529

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- a. Requirements applicable to all Division 22 Sections. Also refer to Division 1 - General Requirements.
- b. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.02 SCOPE OF WORK

- A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.
- B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.
- C. Scope of Work:
 1. Plumbing Work shall include, but is not necessarily limited to:
 - a. Furnish and install all items listed in the Plumbing Material List.
 - b. Furnish and install a new domestic water service to the building.
 - c. Furnish and install water meter and domestic water backflow preventer as required by Code.
 - d. Furnish and install a complete domestic water piping system including cold, hot, and hot water circulating piping within the building. Insulate all piping as specified.
 - e. Furnish and install water heaters.
 - f. Furnish and install complete storm water drainage system.
 - g. Furnish and install complete sanitary sewer and vent system.
 - h. Furnish and install sanitary sewage ejector basins and pumps.
 - i. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 22 05 50.
 - j. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
 - k. Complete all applicable tests, certifications, forms, and matrices.

1.03 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.
- B. Itemize all work and list associated hours and pay scale for each item.

1.04 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:
 - a. Plumbing Contractor.
 - b. Heating Contractor.
 - c. Air Conditioning and Ventilating Contractor.
 - d. Temperature Control Contractor.
 - e. Fire Protection Contractor.
 - f. Testing, Adjusting, and Balancing Contractor.
2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.
 - a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.
6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:
 - a. Light fixtures.
 - b. Gravity flow piping, including steam and condensate.
 - c. Electrical busduct.
 - d. Sheet metal.
 - e. Electrical cable trays, including access space.
 - f. Sprinkler piping and other piping.
 - g. Electrical conduits and wireway.

1.05 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
 - a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
 - b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - d. Maintenance clearances and code-required dedicated space shall be included.
 - e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.
 - a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.
3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
 - a. Scale of drawings:
 - 1) General plans: 1/4 Inch = 1'-0" (minimum).
 - 2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
 - 3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
 - 4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
 - 5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).
2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the Architect/Engineer for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the Architect/Engineer and Owner's Representative. The Architect/Engineer will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.

3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The Architect/Engineer reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the Architect/Engineer.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
 - a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
 - b. Potential layout changes shall be made to avoid additional access panels.
 - c. Additional access panels shall not be allowed without written approval from the Architect/Engineer at the coordination drawing stage.
 - d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the Architect/Engineer and the Owner's Representative.
 - e. When additional access panels are required, they shall be provided without additional cost to the Owner.
10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.06 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the State of North Carolina Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all published standards of Insert.
3. Conform to all State Codes.
4. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.
5. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
6. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
7. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
8. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
9. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be **listed by Underwriters' Laboratories, Inc. and approved by FM Global.** **[approved or listed by Underwriter's Laboratories, Inc.]**

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for service connections, such as sewer and water.
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:

1. The drawings for the plumbing work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.

3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
 - a. Any item listed as furnished shall also be installed, unless otherwise noted.
 - b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.07 WEB-BASED PROJECT SOFTWARE

- A. The General Contractor shall provide a web-based project software site for the purpose of hosting and managing project communication and documentation until completion of the warranty phase.

- B. The web-based project software shall include, at a minimum, the following features: construction schedule, submittals, RFIs, ASIs, construction change directives, change orders, drawing management, specification management, payment applications, contract modifications, meeting minutes, construction progress photos.
- C. Provide web-based project software user licenses for use by the Architect/Engineer. Access will be provided from the start of the project through the completion of the warranty phase.
- D. At project completion, provide digital archive of entire project in format that is readable by common desktop software applications in format acceptable to Architect/Engineer. Provide data in locked format to prevent further changes.

1.08 SUBMITTALS

- A. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

- 1. Transmittal: Each transmittal shall include the following:
 - a. Date
 - b. Project title and number
 - c. Contractor's name and address
 - d. Division of work (e.g., plumbing, heating, ventilating, etc.)
 - e. Description of items submitted and relevant specification number
 - f. Notations of deviations from the contract documents
 - g. Other pertinent data
- 2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
 - a. Date
 - b. Project title and number
 - c. Architect/Engineer
 - d. Contractor and subcontractors' names and addresses
 - e. Supplier and manufacturer's names and addresses
 - f. Division of work (e.g., plumbing, heating, ventilating, etc.)
 - g. Description of item submitted (using project nomenclature) and relevant specification number
 - h. Notations of deviations from the contract documents
 - i. Other pertinent data
 - j. Provide space for Contractor's review stamps
- 3. Composition:
 - a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
 - b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
 - c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:
 - a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
 - b. Unstamped submittals will be rejected.
 - c. The Contractor's review shall include, but not be limited to, verification of the following:
 - 1) Only approved manufacturers are used.
 - 2) Addenda items have been incorporated.
 - 3) Catalog numbers and options match those specified.
 - 4) Performance data matches that specified.
 - 5) Electrical characteristics and loads match those specified.
 - 6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
 - 7) Dimensions and service clearances are suitable for the intended location.
 - 8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
 - 9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
 - d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
 - e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.
6. Submittal Identification and Markings:
 - a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
 - b. The Contractor shall clearly indicate the size, finish, material, etc.
 - c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
 - d. All marks and identifications on the submittals shall be unambiguous.
7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.

12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.
 - a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.
16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

B. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
 - a. Submittal file name: 22 XX XX.description.YYYYMMDD
 - b. Transmittal file name: 22 XX XX.description.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

C. Paper Copy Submittal Procedures:

1. Paper copies are acceptable where electronic copies are not provided.
2. The Contractor shall submit ten (10) paper copies of each shop drawing.
3. Each set shall be bound in a three-ring binder or presentation binder. Copies that are loose or in pocket folders are not acceptable.

1.09 SCHEDULE OF VALUES

- A. The requirements herein are in addition to the provisions of Division 1.
- B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:
 - a. Material: Delivered cost of product with taxes paid.
 - b. Labor: Labor cost, excluding overhead and profit.
3. Itemize the cost for each of the following:
 - a. Overhead and profit.
 - b. Bonds.
 - c. Insurance.
 - d. General Requirements: Itemize all requirements.
4. For each line item having an installed cost of more than \$5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:
 - a. Excavation and backfill for underground piping systems inside the building.
 - b. Underground piping systems inside the building (sanitary, storm, etc.) listed separately. Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
 - c. Each aboveground piping system (sanitary, storm, domestic water, etc.). Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
 - d. Pipe insulation with separate material and labor line items for each piping system listed above.
 - e. Each piece of equipment requiring shop drawings (e.g., backflow preventer, water heater, water softener, etc.) using the project nomenclature (BFP-1, WH-1, WS-1, etc.).
 - f. Each plumbing fixture (e.g., WC, lavatory, sink, etc.). Multiple units of the same type can be listed together, provided quantities are also listed so unit costs can be determined.
 - g. Site utilities (5' beyond building)
 - h. Seismic design
 - i. Water balancing
 - j. Commissioning
 - k. Record drawings
 - l. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.10 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.
- B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.
- C. Change order work shall not proceed until authorized.

1.11 EQUIPMENT SUPPLIERS' INSPECTION

- A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:
 - 1. Fire Seal Systems
 - 2. Seismic Restraints and Equipment Bracing
- B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.
- C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.12 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.
- B. Protect equipment, components, and openings with airtight covers and exercise care at every stage of storage, handling, and installation of equipment to prevent airborne dust and dirt from entering or fouling equipment to include, but not limited to:
 - 1. Motor windings and ventilation openings.
 - 2. Bearings.
 - 3. Equipment Pipe and Accessories connection openings. (e.g. boiler connections, coil connections, etc.)
 - 4. Starter and control cabinets.
 - 5. Heat transfer coils.
 - 6. Pump Seals.
 - 7. Combustion burner and blower equipment (e.g. combustion air intake, combustion vent/flue, etc.)
- C. Equipment and components that are visibly damaged or have been subject to environmental conditions prior to building turnover to Owner that could shorten the life of the component (for example, water damage, humidity, dust and debris, excessive hot or cold storage location, etc.) shall be repaired or replaced with new equipment or components without additional cost to the building owner.

- D. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- E. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- F. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.13 NETWORK / INTERNET CONNECTED EQUIPMENT

- A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.14 WARRANTY

- A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.15 INSURANCE

- A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.16 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the first manufacturer is the basis for job design and establishes the quality.
- B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.
- D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractor's part or on the part of other Contractors whose work is affected.
- E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.
- F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.02 EXCAVATION, FILL, BACKFILL, COMPACTION

- A. General:
 - 1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (<https://call811.com/>) or by calling 811.
 - 2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.
- B. Excavation:
 - 1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
 - 2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
 - 3. Trim bottom and sides of excavations to grades required for foundations.

4. Protect excavations against frost and freezing.
 5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
 6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
 7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
 8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.
- C. Dewatering:
1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.
- D. Underground Obstructions:
1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
 2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.
- E. Fill and Backfilling:
1. Utilities Bedding: Lay underground utilities on minimum of 6" sand bedding or CA6 crushed stone. Compact bedding under utilities smooth, with no sharp edges protruding, to protect the utilities from puncture. Shape bedding to provide continuous support for bells, joints, and barrels of utilities and for joints and fittings.
 2. Envelope Around Utilities to 6" Above Utilities: Place sand or CA6 crushed stone to a height of 6" over utilities in 6" layers. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
 3. Backfill From 6" Above Utilities to Earthen Grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep.
 4. Backfill From 6" Above Utilities to Below Slabs or Paved Area: Where the sand or CA6 crushed stone fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
 5. Backfill Materials:
 - a. Sand, CA6: Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
 - b. Native Soil: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Native soils shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.

- c. Flowable Fill: Cementitious, self-leveling, self-compacting slurry as defined by the ACI with compressive strength of 50-100psi at 28 days; consisting of a mixture of fine aggregate or filler, water and cementitious materials. Filler material consist of sand, fly ash, spent foundry sand, quarry fines, baghouse dust. Cementitious materials consist of Portland cement, pozzolanic materials, and self-cementing materials. Flowable fill may be placed in a pour instead of 6" layers noted above.
 6. Water shall not be permitted to rise in unbackfilled trenches.
 7. Dispose of excess excavated earth as directed.
 8. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
 9. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.
- F. Surface Restoration:
1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
 2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.03 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
1. Placing fill over underground and underslab utilities.
 2. Covering exterior walls, interior partitions and chases.
 3. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.
- C. Above-Ceiling Final Observation
1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
 - a. Pipe insulation is installed and fully sealed.
 - b. Pipe wall penetrations are sealed.
 - c. Pipe identification and valve tags are installed.
 2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
 3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.04 PROJECT CLOSEOUT

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
 - 1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
 - 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
 - 3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
 - 4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.
- C. Before final payment is authorized, this Contractor must submit the following:
 - 1. Operation and maintenance manuals with copies of approved shop drawings.
 - 2. Record documents including marked-up or reproducible drawings and specifications.
 - 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
 - 4. Start-up reports on all equipment requiring a factory installation inspection or start-up.
 - 5. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. General:
 - 1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
 - 2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.
- B. Electronic Submittal Procedures:
 - 1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
 - 2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
 - 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
 - a. O&M file name: O&M.div22.contractor.YYYYMMDD
 - b. Transmittal file name: O&Mtransmittal.div22.contractor.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Paper Copy Submittal Procedures:

1. Once the electronic version of the manuals has been approved by the Architect/Engineer, paper copies of the O&M manual shall be provided to the Owner. The content of the paper copies shall be identical to the corrected electronic copy.
2. Binder Requirements: The Contractor shall submit O&M manuals in heavy duty, locking three ring binders. Incorporate clear vinyl sheet sleeves on the front cover and spine for slip-in labeling. "Peel and stick" acceptable. Sheet lifters shall be supplied at the front of each notebook. The three-ring binders shall be 1/2" thicker than initial material to allow for future inserts. If more than one notebook is required, label in consecutive order. For example; 1 of 2, 2 of 2. No other form of binding is acceptable.
3. Binder Labels: Label the front and spine of each binder with "Operation and Maintenance Instructions", title of project, and subject matter.
4. Index Tabs: Divide information by specification section, major equipment, or systems using index tabs. All tab titling shall be clearly printed under reinforced plastic tabs. All equipment shall be labeled to match the identification in the construction documents.

D. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.

10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.
16. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

3.06 INSTRUCTING THE OWNER'S REPRESENTATIVES

- A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.
- B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.
- C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.
- D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.
- E. The instructions shall include:
 1. Explanation of all system flow diagrams.
 2. Maintenance of equipment.
 3. Start-up procedures for all major equipment.
 4. Explanation of seasonal system changes.
 5. Explanation of Owner's Responsibilities to operate, maintain, and flush domestic water system (i.e., ASHRAE Standard 188).
- F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.
- G. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.
- H. Operating Instructions:
 1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
 2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.07 SYSTEM STARTING AND ADJUSTING

- A. The plumbing systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final adjustments as required.
- B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.
- C. Contractor shall adjust the plumbing systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.
- D. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.
- E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.08 RECORD DOCUMENTS

- A. The following paragraphs supplement Division 1 requirements.
- B. Maintain at the job site a separate and complete set of plumbing drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.
- C. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations devices, requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.
- D. Before completion of the project, a set of reproducible plumbing drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.
- E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.
- F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

- G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.09 PAINTING

- A. This Contractor shall paint the following items:
 - 1. All piping in mechanical room
 - 2. Piping exposed in kitchen
- B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.
- C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.
- D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.
- E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.
- F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.
- H. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:
 - 1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
 - 2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.
 - 3. Color of paint shall be as follows:
 - a. All piping in mechanical room:
 - 1) Domestic Cold Water: Blue pipe/white letters
 - 2) Domestic Hot Water: Red pipe/white letters
 - 3) Sanitary Waste: Green pipe/black letters

3.10 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

- B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.
- C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.
- D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

- A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.
- B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
 - 1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
 - a. Minimizing the amount of dust generated.
 - b. Reducing solvent fumes and VOC emissions.
 - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
 - d. Protect stored on-site and installed absorptive materials from moisture damage.
 - 2. Request that the Owner designate an IAQ representative.
 - 3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
 - 4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
 - 5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
 - 6. Request copies of and follow all of the Owner's IAQ and infection control policies.
 - 7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
 - 8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
 - 9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

3.13 UTILITY REBATE

- A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.
 - 1. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. All plumbing fixtures installed and caulked.
4. Pipe insulation complete, pipes labeled and valves tagged.
5. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION

SECTION 22 05 03 - THROUGH PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Through-Penetration Firestopping.

1.02 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.03 REFERENCES

- A. UL 263 - Fire Tests of Building Construction and Materials
- B. UL 723 - Surface Burning Characteristics of Building Materials
- C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- D. UL 2079 - Tests for Fire Resistance of Building Joint Systems
- E. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- F. Intertek / Warnock Hersey - Directory of Listed Products
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- I. The Building Officials and Code Administrators National Building Code
- J. 1997 Uniform Building Code
- K. 2018 International Building Code
- L. NFPA 5000 - Building Construction Safety Code
- M. HCAI - Health Care Access and Information (California)

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

1.05 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.06 MEETINGS

- A. Pre-installation meeting: A pre-installation meeting shall be scheduled and shall include the General Contractor, all Subcontractors associated with the installation of systems penetrating fire barriers, Firestopping Manufacturer's Representative, and the Owner.
 - 1. Review foreseeable methods related to firestopping work.
 - 2. Tour representative areas where firestopping is to be installed; inspect and discuss each type of condition and each type of substrate that will be encountered, and preparation to be performed by other trades.

1.07 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
1. 3M; Fire Protection Products Division.
 2. Hilti, Inc.
 3. RectorSeal Corporation, Metacaulk.
 4. Tremco; Sealant/Weatherproofing Division.
 5. Johns-Manville.
 6. Specified Technologies Inc. (S.T.I.)
 7. Spec Seal Firestop Products
 8. AD Firebarrier Protection Systems
 9. Dow Corning Corp.
 10. Fire Trak Corp.
 11. International Protective Coating Corp.
 12. HoldRite

2.02 THROUGH PENETRATION FIRESTOP SYSTEMS

- A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture resistant.
- E. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- F. Provide firestopping systems allowing continuous insulation for all insulated pipes.
- G. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:

1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated:

- a. F Rating = Floor/Wall Rating

Penetrating Item	UL System No.
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999

Penetrating Item	UL System No.
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999
*Alternate method of firestopping is patching opening to match original rated construction.	

2. Non-Combustible Framed Walls - 1 or 2 Hour Rated:

a. F Rating = Floor/Wall Rating

Penetrating Item	UL System No.
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999
*Alternate method of firestopping is patching opening to match original rated construction.	

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated:

a. F Rating = Wall/Floor Rating

Penetrating Item	UL System No.
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999
*Alternate method of firestopping is patching opening to match original rated construction.	

H. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.

I. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.02 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.
- B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.
- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

3.03 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.04 IDENTIFICATION

- A. Provide and install labels adjacent to each firestopping location. Label shall be provided by the firestop system supplier and contain the following information in a contrasting color:
 - 1. The words "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."

2. Firestop System Supplier; UL or listed by Intertek / Warnock Hersey system number; date installed; contractor name and phone number; manufacturer's representative name, address, and phone number.

3.05 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.
- D. The Contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the Contractor and witnessed by the Architect/Engineer and manufacturer's factory representative. The Architect/Engineer shall have sole discretion of which firestop system installations will be reviewed. The Contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the Architect/Engineer's discretion and the Contractor's expense.

END OF SECTION

SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hangers, Supports, and Associated Anchors.
- B. Equipment Bases and Supports.
- C. Sleeves and Seals.
- D. Flashing and Sealing of Equipment and Pipe Stacks.
- E. Cutting of Openings.
- F. Escutcheon Plates and Trim.

1.02 REFERENCES

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- B. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
- C. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices
- D. MSS SP-127 - Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.03 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 22 05 00. Include plastic pipe manufacturers' support spacing requirements.

1.04 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.01 SEISMIC RESTRAINTS

- A. Refer to Section 22 05 50 for additional requirements for seismic restraints.

2.02 HANGER RODS

- A. Hanger rods for single rod hangers shall conform to the following:
 - 1. Copper and Plastic Pipe:
 - a. Hanger Rod Diameter:

- 1) 2" and smaller: 3/8"
- 2) 2-1/2" through 3-5/8": 1/2"
- 3) 4" through 6": 1/2"
- 4) 8": 5/8"
- 5) 10": 3/4"
- 6) 12": 7/8"
- 7) 14" and 16": 1"
- 8) 18" and 24": 1-1/4"

- B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.
- C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
- D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

2.03 PIPE AND STRUCTURAL SUPPORTS

A. General:

1. Pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS SP-58, 69, 89, and 127 (where applicable).
2. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Refer to insulation specifications for materials and additional information.
3. Copper piping located in an exposed area, including indirect waste piping in janitor's closets, shall use split ring standoff hangers for copper tubing. Support shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp. Use electro-galvanized or more corrosion resistant and threaded rod for floor applications. Use anchors applicable to the wall type with corrosion resistant threaded rod for wall applications.
 - a. Products:
 - 1) nVent/M-Co Model #456
 - 2) Eaton Fig. 3198HCT
 - 3) Anvil Fig. CT138R

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, unless otherwise noted by applicable codes, but never at intervals over 15 feet. Support vertical pipes with riser clamps installed below hubs, couplings, or lugs. Provide sufficient flexibility to accommodate expansion and contraction to avoid compromising fire barrier penetrations or stressing piping at fixed takeoff locations.
 - a. Products:
 - 1) Eaton Fig B3373 Series
 - 2) nVent 510 Series
 - 3) Anvil Fig. 90

2. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs. Wall supports shall be coordinated with the Structural Engineer.
3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

C. Hangers and Clamps:

1. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
2. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp within their temperature limits of -65F to +275F.
3. Vertical cold pipe drops and rough-ins to fixtures shall be supported by insulated pipe clamps to prevent thermal bridging and condensation.
4. On all insulated piping, provide a semi-cylindrical metallic shield and vapor barrier jacket.
5. Unless otherwise indicated, hangers shall be as follows:
 - a. Clevis Type: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches & Smaller
 - 1) Products: Bare Steel Plastic or Insulated Pipe:
 - a) Anvil Fig. 260
 - b) Eaton Fig. 3100
 - c) nVent Model 400
 - b. Continuous Channel with Clevis Type: Service: Plastic Tubing, Flexible Hose, Soft Copper Tubing:
 - 1) Products:
 - a) Eaton Fig. B3106, with Fig. B3106V
 - b) nVent Model 104, with Model 104V
 - c) Anvil Fig. 1V
6. Support may be fabricated from U-channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.
 - a. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
 - b. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip galvanized finish applied after fabrication.

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:

- a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.):
 - 1) Products:
 - a) Anvil Fig. 86
 - b) Eaton Fig. B3033/B3034
 - c) nVent Model 300 & 310
- b. Steel Structure Clamps: Scissor Type Beam Clamps (for use with bar-joists and wide flange):
 - 1) Products:
 - a) Anvil Fig. 228, 292
 - b) Eaton Fig. B3054
 - c) nVent Model 360
- c. Concentrically Loaded Open Web Joist Hangers (for use with bar joists):
 - 1) Products:
 - a) MCL. M1, M2 or M3
- d. Concrete: Concrete Inserts, Single Rod Galvanized:
 - 1) Products:
 - a) Anvil Fig. 282
 - b) Eaton Fig. B3014
 - c) nVent Model 355
- e. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-[05]. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
- f. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.
- g. Steel Structure Welding:
 - 1) Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and protecting walls and ceilings from smoke damage.

2.04 FOUNDATIONS, BASES, AND SUPPORTS

A. Basic Requirements:

- 1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.

2. All concrete foundations, bases and supports, shall be reinforced. All steel bases and supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.

B. Concrete Bases (Housekeeping Pads):

1. Refer to Section 22 05 50 for additional requirements for concrete bases in seismic applications.
2. Unless shown otherwise on the drawings, concrete bases shall be nominal 4 inches thick and shall extend 6 inches on all sides of the equipment (6 inches larger than factory base), except where pad extension would interfere with working space at equipment control panels and electrical panels.
3. Where a base is less than 12 inches from a wall, extend the base to the wall to prevent a "dirt-trap".
4. Concrete materials and workmanship required for the Contractor's work shall be provided by the Contractor. Materials and workmanship shall conform to the applicable standards of the Portland Cement Association. Reinforce with 6"x6", W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at 28 days.
5. Equipment requiring bases is as follows:
 - a. Water Heater

C. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.
2. Hang heavy equipment from concrete floors or ceilings with Architect/Engineer-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.

D. Grout:

1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

2.05 OPENINGS IN FLOORS, WALLS AND CEILINGS

- A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.
- B. Coordinate all openings with other Contractors.
- C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.
- D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.

- E. Do not cut structural members without written approval of the Architect or Structural Engineer.
- F. Exposed Housing Penetrations: Seal pipes with surface temperature below 150F, penetrating housings with conical stepped, white silicone, EPDM or neoprene pipe flashings and stainless-steel clamps equal to Portals Plus Pipe Boots or Pipetite.

2.06 ROOF PENETRATIONS

- A. Roof Curb Enclosure: Provide weatherproof roof curb and enclosure for pipe penetrations. Refer to drawings for details.
- B. Conical Pipe Boot: Seal pipes with surface temperature below 150F, penetrating single-ply roofs with conical stepped, UV-resistant silicone, EPDM or neoprene pipe flashings and stainless-steel clamps equal to Portals Plus Pipe Boots or Pipetite. Color: White shall match roofing membrane.
- C. Break insulation only at the clamp for pipes between 60F and 150F. Seal outdoor insulation edges watertight.

2.07 SLEEVES AND LINTELS

- A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.
- B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.
- C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.
- D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.
- E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.
- F. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.
- G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (e.g., foam, rubber, asphalt-coated fiber, bituminous-impregnated felt, or cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.
- I. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.
- J. Wall Seals ("Link-Seals"):

1. Underground foundation wall penetrations and where shown on the drawings, pipes passing through walls, ceilings, or floors shall have their annular space (sleeve or drilled hole - not tapered hole made with knockout plug) sealed by properly sized sealing elements consisting of a synthetic rubber material compounded to resist aging, ozone, sunlight, water and chemical action.
2. Sleeves, if used, shall be at least 2 pipe sizes larger than the service pipe and shall include a waterstop/anchor around the mid-section of the sleeve, continuously welded to or integral formed with the sleeve. Sleeve material options based on fluid carrying pipe design temperature:
 - a. Any temperature: galvanized steel, painted steel.
 - b. Only fluids below 120°F HDPE, PVC.
3. Pressure shall be maintained by stainless steel bolts and other parts. Pressure plates may be of composite material for Models S and OS.
4. Sealing element shall be as follows:

Model	Service	Element Material	Temperature Range
S	Standard (Stainless)	EPDM	-40F to 250F
T	High/Low Temperature (Steam)	Silicone	-67F to 400F
T	Fire Seals (1 hour)	Silicone	-67F to 400F
FS	Fire Seals (3 hours)	Silicone	-67F to 400F
OS	Oil Resistant/Stainless	Nitrile	-40F to 210F

5. Manufacturers:
 - a. Garlock Pipeline Technologies (GPT) "Link-Seals"
 - b. O-Z/Gedney Company
 - c. Calpico, Inc.
 - d. Innerlynx
 - e. Metraflex
 - f. Flexicraft
 - g. Polywater

2.08 ESCUTCHEON PLATES AND TRIM

- A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.
- B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.
- C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.09 PIPE PENETRATIONS

- A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.
- B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.10 PIPE ANCHORS

- A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.
- B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.11 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.01 PLUMBING SUPPORTS AND ANCHORS

- A. General Installation Requirements:
 - 1. Install all items per manufacturer's instructions.
 - 2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
 - 3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
 - 4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with Sheet Metal Contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.
- B. Supports Requirements:
 - 1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
 - 2. Set all concrete inserts in place before pouring concrete.
 - 3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
 - 4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
 - 5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.
- C. Pipe Requirements:
 - 1. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
 - 2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
 - 3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
 - 4. Piping shall not introduce strains or distortion to connected equipment.
 - 5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
 - 6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.

7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
 8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.
- D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:
1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
 2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
 - a. The hanger is attached within 6" from a web/chord joint.
 - b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
 3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
 4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.
- E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.
- F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- H. Steel/Concrete Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:
1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):
 - a. Maximum Spacing:
 - 1) 1-1/4" & under: 7'-0"
 - 2) 1-1/2": 9'-0"
 - 3) 2": 10'-0"
 - 4) 2-1/2": 11'-0"
 - 5) 3": 12'-0"
 - 6) 4" & larger: 12'-0"
 2. Steel (Std. Weight or Heavier - Vapor Service):
 - a. Maximum Spacing:
 - 1) 1-1/4" and under: 9'-0"

- 2) 1-1/2": 12'-0"
 - 3) 2" & larger: 12'-0"
- 3. Hard Drawn Copper & Brass (Liquid Service):
 - a. Maximum Spacing:
 - 1) 3/4" and under: 5'-0"
 - 2) 1": 6'-0"
 - 3) 1-1/4": 7'-0"
 - 4) 1-1/2": 8'-0"
 - 5) 2": 8'-0"
 - 6) 2-1/2": 9'-0"
 - 7) 3": 10'-0"
 - 8) 4": 12'-0"
 - 9) 6": 12'-0"
- 4. Hard Drawn Copper & Brass (Vapor Service):
 - a. Maximum Spacing:
 - 1) 3/4" & under: 7'-0"
 - 2) 1": 8'-0"
 - 3) 1-1/4": 9'-0"
 - 4) 1-1/2": 10'-0"
 - 5) 2": 11'-0"
 - 6) 2-1/2" & larger: 12'-0"
- 5. Plastic Pipe:
 - a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.
- 6. Ultra-Flexible Pipe, and Flexible Hose, and Soft Copper Tubing:
 - a. Continuous channel with hangers maximum 8'-0" OC.
- I. Installation of hangers shall conform to MSS SP-58, 69, 89 and the applicable Plumbing Code.

END OF SECTION

SECTION 22 05 50 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Seismic Requirements.

1.02 QUALITY ASSURANCE

- A. General:
 - 1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
 - 2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
 - 3. These requirements are beyond those listed in Section 22 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.
- B. Manufacturer:
 - 1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
 - 2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.
- C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.
- D. Installer: Company specializing in performing the work of this Section.

1.03 REFERENCES

- A. International Building Code, 2018.
- B. ASHRAE - A Practical Guide to Seismic Restraint.
- C. Technical Manual 5-809-10, NAVFAC P-355, Air Force Manual 88-3, Chapter 13.
- D. ASCE 7-02, Chapter 9. ASCE 7-05, Chapter 13. ASCE 7-10, Chapter 13. ASCE 7-16, Chapter 13.
- H. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems.
- I. NFPA 13 - Installation of Sprinkler Systems.
- J. NFPA 14 - Standpipe and Hose Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Section 22 05 00.
- B. Shop Drawings:
 - 1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
 - 2. Coordination Drawings: Plans and sections drawn to scale, coordinating seismic bracing of mechanical components with other systems and equipment in the vicinity, including other seismic restraints.
 - 3. Manufacturer's Certifications: Professional Structural Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
 - 4. System Supports/Restraints - Submit for each condition requiring seismic bracing:
 - a. Calculations for each seismic brace and detail utilized on the project.
 - b. Plan drawings showing locations and types of seismic braces on contractor fabrication/installation drawings.
 - c. Cross-reference between details and plan drawings to indicate exactly which brace is being installed at each location. Details provided are to clearly indicate attachments to structure, correctly representing the fastening requirements of bracing.
 - d. Clear indication of brace design forces and maximum potential component forces at attachment points to building structure for confirmation of acceptability by the Structural Engineer of Record.
 - 5. Equipment - Submit for each piece of equipment supplied:
 - a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified.
 - b. Specific details of seismic design features of equipment and maximum seismic loads imparted to the structural support.
 - c. Engineering calculations and details for equipment anchorage and support structure.
- C. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.05 TESTING AND INSPECTION

- A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the Building Code.
- B. The Contractor shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

- C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.
- D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.07 DESIGN REQUIREMENTS

- A. This project is subject to the seismic bracing requirements of the International Building Code, 2018 edition.
- B. The following criteria are applicable to this project:
 - 1. Risk Category: III
 - 2. Seismic Importance Factor: $IE = 1.25$
 - Seismic Design Category: B
 - 4. Component Amplification Factors (a_p) and Component Response Modification Factors (R_p) shall be taken from Table 13.5-1 in ASCE 7-16 for the individual equipment or system being restrained.
 - 5. Component Importance Factors (I_p) shall be taken from Section 13.1.3 in ASCE 7-16 for the individual equipment or system being restrained.
 - 6. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.
- C. Forces shall be calculated with the above requirements and Equations 13.3-1, -2, and -3 of ASCE 7-16, unless exempted by 13.1.4.
- D. Equipment shall meet International Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.
- E. All seismic anchorage and bracing shall comply with the St. Louis County Rules & Regulations on Anchorage & Sway Bracing - Mechanical, Electrical & Plumbing (MEP) System Components.
- F. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.08 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

- B. Coordinate concrete bases with building structural system.

1.09 WARRANTY

- A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.01 SUPPLIERS

- A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation <http://www.unistrut.us/>
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, <https://virs.vibro-acoustics.com/>

2.02 SEISMIC DESIGN CRITERIA

- A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

- B. Definitions:

1. Stay in Place:
 - a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.
2. Remain Operational:
 - a. Requirements for "Stay in Place" listed above shall be met.
 - b. The following systems and associated equipment are intended not to fail externally or internally and are intended to continue operation following a seismic event:
 - 1) Plumbing
 - 2) Medical Gas

2.03 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

- A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.

3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
 4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
 5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
 6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.
- B. Friction from gravity loads shall not be considered resistance to seismic forces.
- C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.
- D. Housekeeping Pads:
1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.04 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

- A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.
- B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:
1. Air Compressors
 2. Pumps
 3. Tanks

2.05 MATERIALS

- A. Use the following materials for restraints:
1. Indoor Dry Locations: Steel, zinc plated.
 2. Outdoors and Damp Locations: Galvanized steel.
 3. Corrosive Locations: Stainless steel.

2.06 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.07 SEISMIC BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
 - 1. Materials for Channel: ASTM A 1011, GR 33.
 - 2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
 - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
 - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.
 - 1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
 - 2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.
- D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.
- B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.
- C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.
- D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

- E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.
- F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.
- G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.
- H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.
- I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.
- J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.
- K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.
- L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.
- M. Do not install cables over sharp corners.
- N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.
- O. Provide reinforced clevis bolts when required.
- P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.
- Q. Post-Installed anchors shall be provided to meet seismic requirements.
- R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.
- S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.
- T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.
- U. Water tanks shall be secured to their saddles by welding or proper concrete attachment, and those saddles shall be properly attached to the structure.

- V. Brace all terminal units with water coils as required by the building code and provide flexible connection to the coil if bracing is required.
- W. Independently brace duct mounted equipment (terminal units, in-line fans, etc.) and the associated suspended ductwork.
- X. Do not brace a system to two different structures such as a wall and a ceiling.
- Y. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.
- Z. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.
- AA. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.
- BB. Coordinate seismic bracing of architecturally exposed ductwork with the Architect/Engineer.

3.02 SEISMIC RESTRAINT EXCLUSIONS

- A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION

SECTION 22 05 53 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Identification of products installed under Division 22.

1.02 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.
- B. ASTM B-1, B-3, and B-8 for copper conductors.
- C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 " 2kV Cables.
- D. CGA Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders for Medical Use.
- E. NFPA-99: Health Care Facilities.
- F. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

1.03 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00. Include list of items identified, wording, letter sizes, and color coding.
- B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- 1. 3M
- 2. Bunting
- 3. Calpico
- 4. Craftmark
- 5. Emedco
- 6. Kolbi Industries
- 7. Seton
- 8. W.H. Brady
- 9. Marking Services

2.02 MATERIALS

- A. All pipe markers shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
--------------------------	---------------	-----------------

Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

Plastic tags may be used for outside diameters under 3/4"

- B. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.
- C. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1. Indicate fluid conveyed and flow direction.
- D. Ceiling Markers:
 - 1. Label Style:
 - a. The intent is for the ceiling labels to be inconspicuous but easy to find and read while standing underneath. The labels shall be located on the grid T-bar nearest the ceiling tile that can be removed to provide the best access to the serviceable side of equipment or to valves. An arrow can be used to point to the tile needing removal.
 - b. The label tape shall be approximately 1/2" wide with all capitalized letters approximately 3/16" tall.
 - c. Ceiling grid labels shall be made with a label maker with durable adhesive labels having a clear background and black letters.
 - d. Equipment labels shall be as designated on the drawings (e.g., WHA, TP, etc.).
 - e. Valve labels shall be designated by the size, service, and the valve tag number (e.g., 1-1/4" CW #123, 2" HWS #234, etc.). A single longer label can be used to identify multiple valves using spaces between the descriptors if the valves are located close together and have the same service (e.g., CW, HW, and HWC lines serving the same restroom, etc.).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Valves:
 - 1. All valves (except shutoff valves at equipment) shall have numbered tags.
 - 2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
 - 3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
 - 4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
 - 5. Attach to handwheel or around valve stem.
 - 6. Number all tags and show the service of the pipe.

7. Provide one Plexiglas framed valve directory listing all valves, with respective tag numbers, uses and locations. Mount directory in location chosen by the Architect/Engineer.
8. Provide one 36" x 24" minimum Plexiglas framed piping schematic showing valve locations with respective tag numbers. Mount directory in location chosen by the Architect/Engineer.
9. Provide two sets of laminated 8-1/2" x 11" (letter size) copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Architect/Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

3.02 SCHEDULE

A. Pipes to be marked shall be labeled with text as follows, regardless of which method or material is used:

1. HIGH TEMP HOT WATER OVER 240F: Black lettering; yellow background
2. CONDENSATE DRAIN: White lettering; green background
3. COMPRESSED AIR: White lettering; green background
4. CONTROL COMPRESSED AIR: White lettering; green background
5. DOMESTIC COLD WATER: White lettering; green background
6. DOMESTIC HOT WATER - 115F: White lettering; green background
7. DOMESTIC HOT WATER - 140F: White lettering; green background
8. DOMESTIC HOT WATER CIRCULATING - 115F: White lettering; green background
9. DOMESTIC HOT WATER CIRCULATING - 140F: White lettering; green background
10. SANITARY SEWER: Black lettering; yellow background
11. VENT: Black lettering; yellow background
12. STORM SEWER (PRIMARY AND SECONDARY): White lettering; green background
13. NATURAL GAS: Black lettering; yellow background
14. TEMPERED WATER: White lettering; green background
15. TEMPERED WATER RETURN: White lettering; green background
16. MEDICAL VACUUM - 15-30 IN. HG: Black lettering; white background
17. WASTE ANESTHETIC GAS DISPOSAL - 15-30 IN. HG: White lettering; violet background
18. MEDICAL VACUUM and WASTE ANESTHETIC GAS DISPOSAL - 15-30 IN. HG Dual labeled: VAC Black lettering; white background, WAGD White lettering; violet background
19. CARBON DIOXIDE - 50-55 PSI: White lettering; gray background
20. INSTRUMENT AIR - 160-185 PSI: White lettering; red background
21. MEDICAL AIR - 50-55 PSI: Black lettering; yellow background
22. NITROGEN - 160-185 PSI: White lettering; black background
23. NITROUS OXIDE - 50-55 PSI: White lettering; blue background
24. OXYGEN - 50-55 PSI: White lettering; green background
25. HYPERBARIC OXYGEN - 70-75 PSI: White lettering; green background

- 26. FUEL OIL SUPPLY: Black lettering; yellow background
- 27. FUEL OIL RETURN: Black lettering; yellow background

- B. Medical gas pipe markers shall include the system operating pressure shown above.

- C. Medical gas pipe markers shall meet the pipe labeling requirements of NFPA-99.

- D. Ceiling Markers:
 - 1. CLEAN OUT Condensate, Sanitary, Storm, Etc.
 - 2. WATER HAMMER ARRESTOR
 - 3. CONTROL VALVE
 - 4. TRAP PRIMER
 - 5. HWC BALANCING/CONTROL VALVE

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping Insulation.

1.02 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with five years minimum experience.
- B. Materials: Listed and labeled for flame spread/smoke developed rating of no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
- C. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- D. 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. 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.

1.03 REFERENCES

- A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- C. ANSI/ASTM C534 - Elastomeric Foam Insulation.
- D. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.
- E. ASTM C1126 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
- F. ASTM C1729 - Standard Specification for Aluminum Jacketing for Insulation.
- G. ASTM C1767 - Standard Specification for Stainless Steel Jacketing for Insulation.
- H. ASTM E84 - Surface Burning Characteristics of Building Materials.
- I. NFPA 255 - Surface Burning Characteristics of Building Materials.
- J. UL 723 - Surface Burning Characteristics of Building Materials.

- K. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

1.04 SUBMITTALS

- A. Submit shop drawings per Section 22 05 00. Include product description, list of materials and thickness for each service, and locations.

PART 2 - PRODUCTS

2.01 INSULATION

- A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75F; non-combustible. All-purpose polymer or polypropylene service jacket, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.02 INSTALLATION

- A. General Installation Requirements:
 - 1. Install materials per manufacturer's instructions, building codes and industry standards.
 - 2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.
- B. Insulated Piping Operating Below 60F:
 - 1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
 - 2. All balance valves with fluid operating below 60F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve.
- C. Insulated Piping Operating Between 60F and 140F:
 - 1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.
- D. Insulated Piping Operating Above 140F:
 - 1. Insulate fittings, valves, flanges, and strainers.
 - 2. All balance valves with fluid operating above 140F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.
- E. Exposed Piping:

1. Locate and cover seams in least visible locations.
2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
3. On exposed piping serving kitchen equipment or plumbing fixtures, the piping shall be insulated unless local code allows it to be uninsulated. In no instance should the uninsulated portion of the piping be more than 4ft in developed length.

3.03 SUPPORT PROTECTION

- A. Insulation with pipe size greater than 1-1/2" (38mm) shall be protected from sagging and crushing by one of the following means.

1. High Compressive Strength Insert: On all insulated piping greater than 1-1/2", provide shield with insulation insert of same thickness and contour as adjoining insulation at each support, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Inserts shall be as follows:
 - a. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a minimum 180-degree cylindrical segment the same length as metal shields. Inserts shall be:
 - b. Cellular glass (Type C) (for all temperature ranges) with a minimum compressive strength of 90 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
 - c. Molded hydrous calcium silicate (Type D) (only use for pipes with operating temperatures above 90F, with a minimum compressive strength of 100 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
 - d. Polyisocyanurate insulation (Type E) (for pipes below 300F with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3" and below, minimum 60 psi for pipe sizes 4" to 10". For pipe sizes larger than 10", provide rolled steel plate in addition to the shield. Where insulation is installed on piping located within return air plenums and mechanical rooms, insulation shall be listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.
 - e. Provide metal shields between hangers or supports and the pipe insulation/insert. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
 - 1) Shields shall be at least the following lengths and gauges:

Pipe Size	Shield Size
1/2" to 3-1/2"	12" long x 18 gauge
4"	12" long x 16 gauge
5" to 6"	18" long x 16 gauge
8" to 14"	24" long x 14 gauge
16" to 24"	24" long x 12 gauge
 - f. Where rolled steel plate is noted above, provide minimum 1/4" (6mm) rolled galvanized steel plates in addition to the shield as reinforcement on large pipes as noted above to reduce point loading on roller, trapeze hanger and strut support locations depending on insulation compressive strength.

2. Premanufactured Insulation Insert/Shield: As an alternative to separate pipe insulation insert and saddle, properly sized manufactured integral rigid insulation insert and shield assemblies may be used.
 - a. Products:
 - 1) Buckaroo CoolDry
 - 2) Cooper/B-Line Fig. B3380 through B3384
 - 3) Pipe Shields A1000, A2000
 3. Premanufactured Insulation Couplings:
 - a. Molded thermoplastic slip coupling, -65F to 275F, sizes up to 4-1/8" OD, and receive insulation thickness up to 1". Suitable for use indoors or outdoors with UV stabilizers. Vertical insulation riser clamps shall have a 1,000lb vertical load rating. On cold pipes operating below 60F, cover joint and coupling with vapor barrier mastic to ensure continuous vapor barrier.
 - b. PET thermoplastic foam load bearing core with elastomeric foam ends and lap-seal jacket.
 - c. Horizontal Strut Mounted Insulated Pipe Manufacturers:
 - 1) Klo-Shure or equal
 - 2) Armafix Ecolight
 - d. Vertical:
 - 1) Manufacturers: Klo-Shure Titan or equal
 4. Premanufactured shield/saddle for use with Elastomeric Foam (Type B): Molded thermoplastic rigid pipe saddle sized for insulation outside diameter. Length as required by manufacturer.
- B. Rectangular blocks, plugs, or wood material are not acceptable.
- C. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor. Refer to Supports and Anchors specification section for additional information.
- D. Neatly finish insulation at supports, protrusions, and interruptions.
- E. Ferrous hot piping 4 inches and larger, provide steel saddle at rollers as described in Section 22 05 29 "Plumbing Supports and Anchors".

3.04 INSULATION

- A. Type A Insulation:
1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
 2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
 3. Apply insulation with laps on top of pipe.

4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60F, seal fitting covers with vapor retarder mastic in addition to tape.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Check Valves.

1.02 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.
- D. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

1.03 REFERENCES

- A. ANSI/ASME A112.3.1 - Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above and Below Ground.
- B. ASME A112.6.9 - Siphonic Drain Test; The American Society of Mechanical Engineers.
- C. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- D. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- E. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- F. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- G. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- H. ANSI/ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.
- I. ANSI/ASME B31.3 - Chemical Plant and Petroleum Refinery Piping.
- J. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- K. ANSI/ASTM B32 - Solder Metal.
- L. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

- M. ANSI/ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.
- N. ANSI/AWS D1.1 - Structural Welding Code.
- O. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings 3" through 48", for Water and Other Liquids.
- P. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- Q. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- R. ANSI/AWWA C153 - Compact Ductile Iron Fittings 3" through 48", for Water and Other Liquids.
- S. ASME - Boiler and Pressure Vessel Code.
- T. ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.
- U. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- V. ASTM A74 - Hub and Spigot Cast Iron Soil Pipe and Fittings.
- W. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- X. ASTM A312 - Standard for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- Y. ASTM A554 - Standard for Welded Stainless Steel Mechanical Tubing.
- Z. ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
- AA. ASTM A888 - Hubless Cast Iron Soil Pipe and Fittings.
- BB. ASTM B88 - Seamless Copper Water Tube.
- CC. ASTM B306 - Copper Drainage Tube (DWV).
- DD. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- EE. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- FF. ASTM C1540 - Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
- GG. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- HH. ASTM D1785 - Polyvinylchloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- II. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- JJ. ASTM D2661 - ABS DWV Pipe & Fittings.

- KK. ASTM D2665 - PVC DWV Pipe & Fittings.
- LL. ASTM D2846 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
- MM. ASTM D3034 - Type PSM (Polyvinylchloride) (PVC) Sewer Pipe and Fittings.
- NN. ASTM F402 - Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
- OO. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- PP. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- QQ. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipes.
- RR. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- SS. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- TT. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
- UU. ASTM F1412 - Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.
- VV. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing.
- WW. ASTM F2618 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems.
- XX. AWS A5.8 - Brazed Filler Metal.
- YY. AWWA C651 - Disinfecting Water Mains.
- ZZ. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- AAA. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- BBB. FM 1680 - Couplings Used in Hubless Cast Iron Systems.
- CCC. NFPA 24 - Private Fire Service Mains and Their Appurtenances.
- DDD. NFPA 54 - National Fuel Gas Code.
- EEE. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.
- FFF. NSF - National Sanitation Foundation

1.04 SUBMITTALS

- A. Submit shop drawings per Section 22 05 00.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

1.06 COORDINATION DRAWINGS

- A. Reference Coordination Drawings article in Section 22 05 00 for required plumbing systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS

2.01 CAST IRON PIPE

- A. Cast Iron; Standard Weight; Hub and Spigot Joints:
 - 1. Pipe: Standard weight hub and spigot cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 or ASTM A74.
 - 2. Design Pressure: Gravity Maximum Design Temperature: 180F.
 - 3. Joints: Compression gasket, ASTM C564.
 - 4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 301. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
 - 5. Adapters: Heavy duty no-hub transition for joining cast iron and PVC pipe. Adapters shall be tested and certified to ASTM C 1460 and be constructed with Type 304 stainless steel shield, thickness 0.015" shield, gasket material to meet ASTM C564, 1-1/2" to 4" will be 3" wide with four 304 stainless steel bands, and 6" to 10" will be 4" wide with six 304 stainless steel bands and 3/8" 305 stainless steel hex head screws torqued to 80 inch pounds.
- B. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets:
 - 1. Pipe: Standard weight no-hub cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 or ASTM A888.
 - 2. Design Pressure: Gravity Maximum Design Temperature: 180F.
 - 3. Joints: ASTM C1540, FM 1680, and ASTM C-564.
 - a. Super Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.015" thick 304 stainless steel shield, stainless steel 3/8" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky SD-4000 or equal.
 - b. Heavy Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.010" thick 304 stainless steel shield, stainless steel 5/16" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky HD-2000 or equal.
 - 4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 310. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.

5. Adapters: Transition from cast iron soil pipe to other pipe materials with manufactured adapters specifically for the application. Adapter must meet the same requirements as the joints listed above. ASTM C1460. Sticker identifying transition fitting application must be visible to view. For example, the most commonly used transition fitting from cast iron no-hub to PVC would be the Husky SD-4200 series.

2.02 COPPER PIPE

A. Copper Pipe; Type L; Solder Joints:

1. Pipe: Type L hard drawn seamless copper tube, ASTM B88.
2. Design Pressure: 175 psi; Maximum Design Temperature: 200F.
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

B. Copper Pipe; Type K; Solder Joints:

1. Pipe: Type K annealed copper tube, ASTM B88.
2. Design Pressure: 150 psi. Maximum Design Temperature: 200F.
3. Joints: Solder with 100% lead-free solder and flux ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

2.03 PLASTIC PIPE

A. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints:

1. Pipe: Schedule 40 rigid, PVC-DWV, or ABS-DWV, cell classification 12454 for PVC per ASTM D1784 or 42222 for ABS per ASTM D3965, with plain ends, conforming to ASTM Standards D2665 or D2661. Cellular core piping is not acceptable.
2. Design Pressure/Temperature: Gravity at 140F.
3. Joints: Solvent-weld socket type with solvent recommended by pipe manufacturer.
4. Fittings: PVC-DWV, or ABS-DWV, cell classification 12454 for PVC per ASTM D1784 or 42222 for ABS per ASTM D3965, with solvent-weld socket type ends for Schedule 40 pipe.
5. Limits: Schedule 40 PVC-DWV, or ABS-DWV pipe must not be threaded. Do not use where exposed or in return air plenums.
6. Use: Use PVC or ABS only where allowed by local jurisdiction. Comply with all special requirements or limitations.
7. Special Requirements: Provide expansion loop(s) and/or expansion joints in the piping system per the manufacturer's guidelines and as shown on the drawings. Refer to Section 22 05 16 for expansion joint requirements.

2.04 VALVES

A. Shutoff Valves:

1. For pipe systems where mechanical press connections are allowed, shutoff valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. Gate Valves:

- a. GA-1: 2" and under, 150 psi steam at 406F, 300 psi CWP at 150F, screwed, bronze, rising stem, screwed bonnet, lead free NSF-372. Hammond UP640, Milwaukee UP148, Watts B-3210, NIBCO T111-LF, Jomar T-351G.
 - b. GA-2: 2-1/2" thru 12", 125 psi S at 353F, 200 psi CWP at 150F, flanged, iron body, bronze mounted, OS&Y, lead free NSF-372. Hammond IR1146-HI, Milwaukee F-2885-MRW, Watts #F-503, NIBCO F-607-RWSB, Apollo Valves; a division of Aalberts- IPS 611F.
 - c. GA-7: 2-1/2" thru 12", 200 psi CWP at 150F, flanged, iron body, bronze trim, OS&Y, not intended for potable water. Crane #475-1/2, Hammond #IR1146, Stockham #G624, Walworth #8727F, Milwaukee #F2885A, NIBCO F-617-0.
 - d. GA-12: 2-1/2" thru 12", 200 psi CWP, flanged ends, iron body, resilient wedge, "O" ring stem seals, non-rising stem with mounting flange for indicator post or valve box and 2" square nut, counter-clockwise to open, AWWA, lead free NSF-372. Mueller A-2361 Series, Kennedy #C509 Series 8401A.
 - e. GA-13: 2" thru 12", 200 psi CWP, mechanical joint ends, iron body, resilient wedge, "O" ring stem seals, non-rising stem with mounting flange for indicator post or valve box and 2" square nut, counter-clockwise to open, AWWA, lead free NSF-372. Mueller #A-2361 Series with HYMAX Grip Restraint, Kennedy C509 Series 8701.
3. Ball Valves:
- a. BA-1: 3" and under, 150 psi saturated steam, 600 psi CWP, full port, threaded or solder ends (acceptable only if rated for soldering in line with 470F melting point of lead-free solder), stainless steel ball and trim, Teflon seats and seals.
 - 1) Body: Lead free NSF-372, two-piece bronze of a copper alloy containing less than 15% zinc. Apollo Valves; a division of Aalberts-IPS #77CLF140/240 Series, Milwaukee #UPBA450S, Watts #LFB6080G2-SS, NIBCO #T-585-66-LF, Jomar T-200CSSG.
 - 2) Body: Dezincification resistant brass alloy, lead free NSF-372. Jomar T-100CSSG.
 - 3) Provide solid extended shaft for all insulated piping. (For example, Apollo adds option -04 Stem Extension, NIBCO Nib-Seal Handle-NS, and Jomar modifies valve part number with -IH for insulated handle.)
 - 4) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120F, heating water piping over 120F, steam, condensate, boiler feed water piping, and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lockout trim. (For example, Jomar and NIBCO modify valve part number with -LH for locking handle.)
 - b. BA-11: 2" and under, 300 psig water, standard port, screwed or compression. Bronze body and ball of a copper alloy containing less than 15% zinc, chrome plated, Teflon coated, or stainless steel ball. Teflon or Buna-N seats, lead free NSF-372. One piece "T" style cap and stem. A.Y. McDonald 6100 Series, Mueller 300 Series.
 - c. BA-12: 2" and under, 300 psig water, standard port, screwed or compression. Bronze body and ball of a copper alloy containing less than 15% zinc, chrome plated, Teflon coated, or stainless steel ball. Teflon or Buna-N seats, lead free NSF-372. One piece "T" style cap and stem. Minneapolis Pattern threaded top. A.Y. McDonald 6100 Series, Mueller 300 Series.

2.05 CHECK VALVES

- A. For pipe systems where mechanical press connections are allowed, check valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
- B. CK-1: Threaded Ends, 2" and under, 125 psi steam at 406F, 200 psi CWP at 150F, threaded connection, lead free bronze body with brass or bronze disc, horizontal swing. Hammond #UP904, Milwaukee #UP509, NIBCO T-413-Y-LF, Jomar T-511G, Apollo Valves, a division of Aalberts-IPS #161T-LF.
- C. CK-2 :Wafer Style, 2-1/2" thru 12", 200 psi CWP, double disc wafer type, lead free bronze or iron body, bronze trim, metal-to-metal, Buna-N, or EPDM seat, 316 SS shaft. NIBCO W-920-W-LF, Apollo Valves, a division of Aalberts-IPS 910WE-LF, Milwaukee UP1400, Watts ICV-125-2-2-T.
- D. CK-3: Grooved Ends, 2-1/2" thru 12", 300 psi, grooved end, Grade CF8M stainless steel body and disc, 17-4PH stainless steel shaft, with 17-4PH or 316 stainless steel spring, and Grade P fluoroelastomer seat. Suitable for vertical or horizontal installation. Victaulic Series 816.
- E. CK-4: Wafer Style (non-potable) 2-1/2" thru 12", 200 psi CWP, double disc wafer type, iron body, bronze or aluminum-bronze discs, 316SS shaft and spring, Viton, EPDM or BUNA-N, Cv of at least 700 in 6" size. Watts / Mueller Steam Specialty Co. 71, Stockham #WG-961 EPDM or #WG-970 BUNA, NIBCO W-920-W-LF.
- F. CK-5: Flanged Style for Vacuum, 2" and larger, 125 psi CWP, flanged, iron body, cast iron or carbon steel body with stainless steel internals. Hoerbiger Design "CT". Note: Use only for compressor discharge.

2.06 VALVE BOX/CURB BOX

- A. VB-1: 2" and under, extension type curb box with arch pattern base and sufficient length to allow top to terminate flush with finished grade. Cast iron lid with integrally cast brass bushing and marked "water" in integrally cast raised letters. Furnished with valve operating wrench of sufficient length to extend 3' above finished grade when engaged with valve. Construction of curb box shall meet all local codes and requirements. Mueller H-10000 Series, A.Y. McDonald 5600 Series, Tyler Pipe 6500 Series.
- B. VB-2: 2" and under, extension type curb box with Minneapolis pattern base and sufficient length to allow top to terminate flush with finished grade. Cast iron lid with integrally cast brass bushing and marked "water" in integrally cast raised letters. Furnished with valve operating wrench of sufficient length to extend 3' above finished grade when engaged with valve. Construction of curb box shall meet all local codes and requirements. Mueller H-10000 Series, A.Y. McDonald 5600 Series.
- C. VB-3: 3" through 12", extension type valve box with flat base, 5-1/4" shaft and sufficient length to allow top to terminate flush with finished grade. Cast iron lid marked "water" in integrally cast letters. Furnished with valve operating wrench of sufficient length to extend 3' above finished grade when engaged with valve. Construction of curb box shall meet all local codes and requirements. Tyler Pipe 6855 Series.

2.07 LOCK OUT TRIM

- A. Provide lock out trim for all quarter turn shutoff valves opening to atmosphere and installed in domestic water piping over 120F and as indicated on the drawings.

2.08 VALVE OPERATORS

- A. Provide handwheels for gate valves and gear operators for butterfly valves.

2.09 VALVE CONNECTIONS

- A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Install all products per manufacturer's recommendations.
- B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- C. Remove scale and dirt, on inside and outside, before assembly.
- D. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.
- E. Connect to equipment with flanges or unions. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
- F. Use only piping materials rated for the maximum temperature of the application, e.g., do not use PVC for dishwasher drainage or piping that receives boiler blowdown.
- G. Roof Penetration (Vent) Flashing:
 - 1. Built-up Roofing: Flash vents with 3# seamless sheet lead of sufficient size to extend 15" into roofing felts for built-up roofs.
 - 2. Membrane, Metal or Shingled Roofs: Flash vents with premolded pipe flashing cones for single-ply membrane roofs, metal roofs, or shingled roofs.
- H. Existing building sewers or building drains which are shown on the documents to be reused shall be inspected and recorded by closed circuit television for their condition. Report findings back to the Architect, Engineer, and Owner before proceeding with work so any necessary rework can take place if needed.

3.02 SYSTEM, PIPING AND VALVE SCHEDULE

- A. Cold Water, Hot Water, Tempered Water, Reclaimed Water - Potable and Non-Potable (Above Ground):
 - 1. Copper Pipe; Type L; Solder Joints: All Sizes
 - 2. Shutoff Valves:, BA-1
 - 3. Throttling Valves:, GA-2
 - 4. Check Valves: CK-1, CK-2, CK-3

- B. Cold Water, Hot Water, Tempered Water, Reclaimed Water - Potable and Non-Potable (Underground):
 - 1. Copper Pipe; Type K; Solder Joints: All Sizes
- C. Combination Water and Fire Protection Service:
 - 1. Copper Pipe; Type K; Solder Joints: 2" and under
 - 2. Shutoff Valves: GA-1, GA-2, GA-12, GA-13, BA-11, BA-12
 - 3. Valve Box: VB-1, VB-2, VB-3
- D. Shutoff Valves: BA-1, BA-1A Sanitary Waste and Vent, Gravity (Above Ground):
 - 1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
 - 2. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes
- E. Sanitary Indirect Drainage (Above Ground):
 - 1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
- F. Storm Drainage, Clear Water Waste and Vent, Gravity (Above Ground):
 - 1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
- G. Sanitary Waste and Vent, Gravity (Underground - Inside Building):
 - 1. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes
- H. Storm Drainage, Clear Water Waste and Vent, Gravity (Underground - Inside Building):
 - 1. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes
- I. Sanitary Waste and Vent, Gravity (Underground - Outside Building):
 - 1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
 - 2. PVC Pressure Pipe; Schedule 40/SDR26; Push-On Joints - Pressure Pipe: All sizes
- J. Storm Drainage, Gravity (Underground - Outside Building):
 - 1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
 - 2. PVC Pressure Pipe; Schedule 40/SDR26; Push-On Joints - Pressure Pipe: All sizes
- K. Sanitary Waste - Pumped (Underground - Inside Building):
 - 1. Copper Pipe; Type K; Solder Joints: All Sizes
- L. Sanitary Waste - Pumped (Above Ground - Inside Building):
 - 1. Copper Pipe; Type K; Solder Joints: All Sizes
 - 2. Shutoff Valves: BA-1, BA-1A, GA-7
 - 3. Check Valves: CK-1, CK-4
- M. Storm, Clear Water Waste - Pumped (Above Ground - Inside Building):
 - 1. Copper Pipe; Type K; Solder Joints: All Sizes

2. Shutoff Valves: BA-1, BA-1A, GA-7
3. Check Valves: CK-1, CK-4

N. Condensate/Equipment Drainage:

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"

3.03 TESTING PIPING

A. Sanitary Drainage, Sanitary Vent, Storm Drainage:

1. Test all piping with water to prove tight.
2. Test piping before insulation is applied.
3. Hydrostatically test all soil, waste, and vent piping inside of building with 10 feet head of water for 15 minutes. Inspect before fixtures are connected. If leaks appear, repair them and repeat the test.
4. Hydrostatically test interior downspouts with 10 feet head of water for 15 minutes with no leaks.
5. A smoke/air test at the same pressure may be used in lieu of the hydrostatic water test. Exception: Smoke/air test shall not be performed on plastic piping.
6. Test force mains with water at 105% of the operating pump discharge pressure for 15 minutes.
7. Test pressures stated above shall be as listed or as required by the Authority Having Jurisdiction, whichever is most stringent.

B. Hot Water - Potable and Non-Potable, Cold Water - Potable and Non-Potable:

1. Test pipes underground or in chases and walls before piping is concealed.
2. Test all pipes before the insulation is applied. If insulation is applied before the pipe is tested and a leak develops which ruins the insulation, replace damaged insulation.
3. Test the pipe with 100 psig water pressure or equal inert gas such as nitrogen. Exception: Inert gas test shall not be used to test plastic piping.
4. Hold test pressure for at least 2 hours.
5. Test to be witnessed by the Architect/Engineer's representative, if requested by the Architect/Engineer.

C. All Other Piping:

1. Test piping at 150% of normal operating pressure.
2. Piping shall hold this pressure for one hour with no drop in pressure.
3. Test piping using water, nitrogen, or air as compatible with the final service of the pipe. Do not use combustible fluids.
4. Drain and clean all piping after testing is complete.

3.04 CLEANING PIPING

A. Air Blow:

1. Blow out pipe and components with clean compressed air. Instrument air, argon, nitrogen and sulfuric acid lines shall be blown out with dry, oil free air or nitrogen gas. "Oil Free" is defined as air compressed in a centrifugal, Teflon ring, carbon ring or water pumped air compressor. Where air supply is judged to be inadequate to continually attain cleaning velocity, alternate pressurization and sudden relief procedure may be used until discharge at all blow out points is clean. Use 80-90 psig pressure unless otherwise indicated.
2. Air blow applies to the following systems:
 - a. Acetylene
 - b. Carbon Dioxide
 - c. Nitrogen (use oil free air or nitrogen gas)
 - d. Argon (use oil free air or nitrogen gas)
 - e. Instrument Air (use oil free air or nitrogen gas)
 - f. Distilled Water (use maximum of 50 psig pressure)
 - g. Chemical Feed
 - h. Air Compressor Intakes
 - i. Sulfuric Acid (use oil free air or nitrogen gas)

B. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.
3. If necessary, remove valves to clean out all foreign material.

3.05 INSTALLATION

A. General Installation Requirements:

1. Provide dielectric connections between dissimilar metals.
2. Route piping in orderly manner and maintain gradient. Install to conserve building space.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
5. Slope water piping and arrange to drain at low points.
6. Install bell and spigot piping with bells upstream.
7. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
8. Seal pipes passing through exterior walls with a wall seal per Section 22 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
9. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
10. All vertical pipe drops to sinks or other equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.

B. Installation Requirements in Electrical Rooms:

1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.

C. Installation Requirements in MRI (Magnetic Resonance Imaging - Healthcare):

1. All piping in MRI rooms shall be non-ferrous regardless of materials described on Part 2.

D. Valves/Fittings and Accessories:

1. Install shutoff valves that permit the isolation of equipment/fixtures in each room without isolating any other room or portion of the building. Individual fixture angle stops do not meet this requirement. Exception: Back-to-back rooms in no more than two adjacent rooms.
2. Provide clearance for installation of insulation and access to valves and fittings.
3. Provide access doors for concealed valves and fittings.
4. Install valve stems upright or horizontal, not inverted.
5. Provide one plug valve wrench for every ten plug valves 2" and smaller, minimum of one. Provide each plug valve 2-1/2" and larger with a wrench with set screw.
6. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

E. Underground Piping:

1. Install buried water piping outside the building with at least 5 feet of cover. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements
3. Install buried borosilicate glass pipe with the protective polystyrene covering intact. Lay the pipe on bedding and backfill per manufacturer instructions.
4. Install underground, sleeved, corrugated, stainless steel tubing system according to manufacturer's written instructions. Extend vent from sleeve to exterior of building and terminate with screened elbow.
5. Direct buried, uninsulated steel pipe shall have a factory applied external protective coating consisting of two coats with an intermediate layer of 18 mil fibrous glass mat. Coating thickness shall total not less than 3/32". The outer coating shall be further protected by a wrapping of heavy Kraft paper. This external protection shall extend and be exposed for a minimum of 1 foot beyond the buried or concealed portion of the pipe.

a. Manufacturers:

- 1) Pipe Line Service Co., Franklin Park, Illinois
- 2) Lithcote Corp., Melrose Park, Illinois

6. As an option, the Contractor may provide factory applied protective coatings consisting of a polyethylene plastic film bonded to the pipe surface by a hot applied thermo-plastic adhesive.

a. Manufacturers:

- 1) Republic Steel Corp. "X-Tru-Coat"

7. Exercise care in handling, storing and laying pipe to avoid damaging factory applied coatings. If any damage occurs, repair the coating to a condition equal to the original.
8. Field application of protective coatings to joints, fittings and to any damaged factory applied coatings shall be similar to factory applied coatings specified above and shall be done in strict accordance with recommendations of the supplier of pipe coatings.
9. After completion of the fabrication, laying and field coating of the joints and fittings, but prior to backfilling, inspect the entire line in the presence of the Architect/Engineer's representative with an electronic holiday detector. Any defects in the protective coatings shall be repaired in accordance with requirements for original coatings.

10. Coat flange bolts and nuts in pits and below ground at the time of installation with a corrosion protective coating.

F. Sanitary and Storm Piping:

1. Install all sanitary and storm piping inside the building with a slope as shown on the drawings.
2. Install horizontal offset at all connections to roof drains to allow for pipe expansion.
3. Slope sanitary and storm piping outside the building to meet invert elevations shown on drawings and to maintain a minimum velocity of 2 feet per second.
4. Sway Bracing: Where horizontal sanitary and/or storm pipes 4 inches and larger change flow direction greater than 45 degrees, rigid bracing or thrust restraints shall be installed to resist movement of the upstream pipe in the direction of pipe flow. The rigid bracing or thrust restraint shall be connected to structure. A change of flow direction from horizontal into a vertical pipe does not require the upstream pipe to be braced.
5. All sanitary and storm piping shall have at least 42" of cover when leaving the building.
6. Starter fittings with internal baffles are not permitted.

G. Siphonic Storm Piping:

1. Siphonic storm drainage is an engineered piping system. All piping components form part of the hydraulic design calculation that has been engineered to create a siphonic action and make the system function. The Contractor must refer to both the layout drawings and design calculation sheets to identify correct configuration, lengths of pipes, locations of bends, wye branches, and reducers. The Architect/Engineer shall be notified of any changes to the original design. The Contractor shall provide certified drawings from manufacturer if not the basis of design.
2. The piping system shall comprise of swept fittings with 1/4 (90-degree) bend or 1/8 (45-degree) bends and 1/8 (45-degree) wye branches. 90-degree branches (straight or sanitary tees) are not permitted at any time. Where a right-angle branch is required, it shall be made using a 45-degree wye branch connecting to a 45-degree or a combination wye and 1/8 bend.
3. Cleanout/access points are not permitted.
4. The horizontal pipe shall be installed with top of pipe (crown) level; there shall be no pitch. Any changes in diameter shall be created with the transition slope at the invert. The drawings shall notate the top of pipe level.
5. Reducers (increasers) shall be of the eccentric type and oriented to ensure the crown of the two adjoining diameters remains level and the diameter transitioning sloped pipe is at the invert.

3.06 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.
- B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.

- D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.
- E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.
- F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.
- G. Provide flanges or unions at all final connections to equipment, traps and valves.
- H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shutoff valves.
- I. Use full and double lengths of pipe wherever possible.
- J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.
- K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- L. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements.
- M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45-degree or 90-degree angle from the horizontal plane for air lines, and from top, bottom or side for liquids.
- N. Do not use geotextile fabric with footing tile if silt content of soil exceeds 40% or if clay content exceeds 50%. The fabric shall be installed around 1" river rock or 2" limestone.

3.07 DRAINING AND VENTING

- A. Unless otherwise indicated on the drawings, all horizontal water lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.
- B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.
- C. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.
- D. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.
- E. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.

- F. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.
- G. All vent and drain piping shall be of same materials and construction for the service involved.

3.08 PLUMBING VENTS

- A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.
- B. Extend the high side of the soil and waste stacks at least 12" above roof.
- C. Flash pipes at the roof with 3# lead sheet. Extend flashing under roofing 15" in all directions from pipe to be flashed. Extend a lead collar up on the outside of pipe to be flashed and extend 1" beyond the top of the pipe. The 1" excess length of collar shall be turned down into the top of the pipe where it shall fit tight to the inside of the pipe.
- D. Flash pipes at roof with premolded EPDM pipe flashing cones adhered to roof membrane by General Contractor. Secure top of cone with stainless steel clamp and seal watertight.
- E. Increase vent pipes through the roof two pipe sizes with long increasers located at least 12" below the roof.
- F. In no case shall the vent through the roof be less than 4" in diameter.
- G. Vent pipes through the roof shall be located a minimum of [10 feet][25 feet] from any air intake opening on the roof.

3.09 BRANCH CONNECTIONS

- A. For domestic water and vent systems only, make branch connections with standard tee or cross fittings of the type required for the service.
- B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
- C. Do not use double wye or double combination wye and eighth bend DWV fittings in horizontal piping.
- D. Branch connections from the headers and mains may be mechanically formed using an extraction device. The branch piping connection shall be brazed connection for the following services only:
 - 1. Domestic water piping above ground.
- E. Further limit use of mechanically formed fittings as follows:
 - 1. Must have at least same pressure rating as the main.
 - 2. Main must be Type K or L copper tubing.
 - 3. Permanent marking shall indicate insertion depth and orientation.
 - 4. Branch pipe shall conform to the inner curve of the piping main.
 - 5. Main must be 1" or larger.
 - 6. Branch must be 3/4" or larger.

- F. Forged weld-on fittings are limited as follows:
1. Must have at least same pressure rating as the main.
 2. Main must be 2-1/2" or larger.
 3. Branch line is at least two pipe sizes under main size.

3.10 JOINING OF PIPE

- A. Solder Joints (Copper Pipe):
1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined. Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.
 2. Flux shall be non-acid type.
 3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470F melting point solder. Remove discs and seals during soldering if they are not suitable for 470F.
- B. Mechanical Press Connection (Copper and Stainless Steel Pipe):
1. Copper press fitting shall be made in accordance with the manufacturer's installation instructions.
 2. Fully insert tubing into the fitting and mark tubing.
 3. Prior to making connection, the fitting alignment shall be checked against the mark made on the tube to ensure the tubing is fully engaged in the fitting.
 4. Joint shall be pressed with a tool approved by the manufacturer.
 5. Installers shall be trained by manufacturer personnel or representative. Provide documentation upon request.
- C. Hub and Spigot Joints - Sanitary Pipe and Storm Pipe (Cast Iron and Stainless Steel Pipe):
1. Lead and Oakum Joints: Pack joint with oakum made of vegetable fiber, cotton, or hemp. Pour joint with molten lead up to top of hub. Ensure leak-free joints by working joint with inside and outside caulking irons.
 2. Compression Gasket Joints: Joint shall be one-piece double seal compression type gasket made specifically for joining cast iron soil pipe. Gasket shall be neoprene, permitting joint to flex as much as 5 degrees without loss of seal. Gasket shall be extra heavy weight class, conforming to ASTM C-564.
- D. Solvent Weld Joints (PVC):
1. Make joints with a two-step process. Use primer conforming to ASTM F656 and solvent cement conforming to ASTM D2564.
 2. All contractor personnel that will prepare solvent cemented joints shall be qualified for such bonding practices according to the bonding qualifications procedures described in ASME B31.3, Chapter VII for bonding of plastic piping.
- E. Couplings: Assemblies with combinations of clamps, gaskets, sleeves, and threaded or flanged parts; compatible with piping and system liquid; and made by piping manufacturer for joining system piping.

- F. Adapters and Transition Fittings: Assemblies with combinations of clamps, couplings, adapters, gaskets, and threaded or flanged parts; compatible with piping and system liquid; and made for joining different piping materials.
- G. Flanges: Assemblies of companion flanges and gaskets complying with ASME B16.21 and compatible with system liquid, and bolts and nuts.

3.11 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfection of the domestic water piping shall be completed within three (3) weeks prior to building occupancy. Contractor is responsible for disinfecting water piping if used by workers during construction; disinfection during construction does not eliminate the requirement for final disinfection prior to occupancy. Flushing of piping shall be completed within two (2) weeks prior to building occupancy.
- B. Provide necessary connections at the start of individual sections of mains for adding chlorine.
- C. Before starting work, verify system is complete, flushed and clean.
- D. Follow the disinfection of potable water procedure outlined in this project's applicable plumbing code. For example: IPC 610.1, UPC 609.10, CPC 609.10, and Illinois 890.1180. Where local codes do not outline a disinfection procedure, follow the International Plumbing Code procedure 610.1.
- E. Bleed water from all outlets to ensure chlorine distribution throughout the entire domestic water system.
- F. Take water samples, no sooner than 24 hours after flushing, from 2% of outlets and from water entry. Obtain, analyze, and test samples in accordance with AWWA C651, Section 5 - Verification.

3.12 SERVICE CONNECTIONS

- A. Provide new water service with water meter with bypass valves. Provide sleeve in wall for service main per Section 22 05 29.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 10 30 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cleanouts.
- B. Traps.
- C. Trap Seals and Primers.
- D. Floor Drains and Sinks
- E. Hub Drains and Standpipes
- F. Roof Drains.
- G. Backflow Preventers.
- H. Strainers.
- I. Unions.
- J. Balancing Valves.
- K. Water Hammer Arresters.
- L. Dielectric Fittings (Connections Between Dissimilar Metals).
- M. Air Vents.
- N. Drain Valves.
- O. Relief Valves.

1.02 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

1.03 REFERENCES

- A. ANSI A112.21.1 - Floor Drains.
- B. ANSI A112.21.2 - Roof Drains.
- C. ASSE 1010 - Water Hammer Arresters.
- D. ANSI A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.

- E. ANSI A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers.
- F. ASME A112.6.9 - Siphonic Drain Test; The American Society of Mechanical Engineers.
- G. ANSI 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering.
- H. ANSI 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering.
- I. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 1.
- J. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering.
- K. ASSE 1047 - Reduced Pressure Detector Assemblies.
- L. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- M. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
- N. PDI WH-201 - Water Hammer Arresters.

1.04 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00.
- B. Include sizes, rough-in requirements, service sizes, and finishes.

PART 2 - PRODUCTS

2.01 CLEANOUTS

- A. Provide cleanouts as shown and specified on the drawings as well as required by code.
- B. Coordinate floor cleanout cover with surrounding floor finish. Provide either solid, recessed for tile or terrazzo or carpet marker as applicable.
- C. Cleanouts on exposed pipes shall be cast iron with heavy duty cast brass plug with raised head.
- D. Cleanout shall be same size as the pipe up to 6" and 6" for larger pipes.

2.02 TRAPS

- A. Provide all individual connections to the sanitary system with P-traps, except where such drains discharge directly into a properly trapped collection basin or sump. Unless otherwise specified or shown, traps shall be of the same material as specified for waste system.
- B. All traps shall have accessible, removable cleanouts, except where installed on floor drains with removable strainers.

- C. Deep seal pattern traps shall be provided where required by code.
- D. Each trap shall be completely filled with water at the end of construction but before building turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with water.

2.03 TRAP SEALS AND PRIMERS

- A. Provide trap primers as shown and specified on the drawings.
- B. Where trap primers are shown on drawings, coordinate with corresponding floor drains to ensure they include a side inlet connection for the trap primer line.

2.04 FLOOR DRAINS

- A. Floor drains shall be in the form of a receptor with grate/strainer set flush with the surrounding floor.
- B. Provide floor drains and sinks as shown and specified on the drawings as well as required by code.

2.05 HUB DRAINS AND STANDPIPES

- A. A hub drain shall be in the form of a hub or pipe without a grate/strainer extending through the floor for receiving indirect waste. A hub drain has a flood level rim above the finished floor.
- B. Provide hub drains as shown and specified on the drawings as well as required by code.

2.06 ROOF DRAINS

- A. Provide roof drains as shown and specified on the drawings as well as required by code.

2.07 BACKFLOW PREVENTERS

- A. Provide backflow preventers as shown and specified on the drawings as well as required by code.

2.08 STRAINERS

- A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:
 - 1. Air:
 - a. 1/4" - 2": 1/32" perforations
 - b. 2-1/2" - 10": 3/64" perforations
 - c. 12" - 18": 1/16" perforations
 - 2. Water:
 - a. 1/4" - 2": 3/64" perforations
 - b. 2-1/2" - 10": 1/16" perforations
 - c. 12" - 18": 1/8" perforations
 - 3. Lube, Hydraulic, No. 6 Fuel and Waste Oils:

- a. 1/4" - 2": 3/16" perforations
- b. 2-1/2" - 10": 3/16" perforations
- c. 12" - 18": 3/16" perforations

- B. Furnish pipe nipple with shutoff valve to blow down all strainer screens.
- C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

2.09 UNIONS

- A. Copper pipe - wrought copper fitting - ground joint.

2.10 AUTO-THERMOSTATIC ADJUSTABLE BALANCING VALVE

- A. Adjustable thermostatic balancing valve for domestic hot water recirculation circuits. Dry well with temperature gauge and probe. Internal thermostatic balancing cartridge automatically modulates flow to ensure constant temperature. Adjustable from 111F to 140F. Set temperature to 5F below system temperature.
- B. Sizes: 1/2" and 3/4" with NPT female connections. Flow rating: 2.1 Cv maximum, 0.23 Cv minimum, 0.52 Cv design. Suitable fluid: Water.
- C. Maximum working pressure: 230 psi. Maximum differential pressure: 15 psi. Maximum inlet temperature: 195F.
- D. Low-lead brass valve, stainless steel and copper adjustable thermostatic cartridge, EPDM hydraulic seals, stainless steel springs, adjustment knob with temperature adjustment scale, and tamperproof adjustment locking screw with probe dry-well port with shutoff valve and check valve with temperature gauge. If manufactured unit does not contain integral gauge, Contractor shall install external gauge immediately upstream of unit.
- E. Acceptable Manufacturers:
 - 1. Caleffi Thermosetter 116
 - 2. Kemper Multi-Therm 154-02
 - 3. Acorn TZV-1
 - 4. B&G Temp Setter

2.11 WATER HAMMER ARRESTERS

- A. Provide water hammer arresters as shown and specified on the drawings as well as required by code.
- B. ANSI A112.26.1; sized and located in accordance with PDI WH-201, precharged for operation between -100F and 300F and maximum 250 psig working pressure.

2.12 DIELECTRIC FITTINGS (CONNECTIONS BETWEEN DISSIMILAR METALS)

- A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

- B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.
- C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and require isolation from each other with the following exceptions:
 - 1. Iron, steel, and stainless steel connected to each other.
 - 2. Brass, copper, and bronze connected to each other.
 - 3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.
- D. Dielectric protection is required at connections to equipment of a material different than the piping.
- E. Screwed Joints (acceptable up to 2" size):
 - 1. Dielectric waterway rated for 300 psi CWP and 225F.
 - 2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 47, Grinnell Series 407, Matco-Norca.
- F. Flanged Joints (any size):
 - 1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
 - 2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
 - 3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
 - 4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
 - 5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
 - 6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

2.13 AIR VENTS

- A. Provide means for venting air at all high points in the piping system and at all other points where air may be trapped.
- B. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

2.14 DRAIN VALVES

- A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4" male hose thread outlet and cap.

2.15 RELIEF VALVES

- A. RV-3: (Compressed Air) Spring loaded disc type, cast iron or steel body, stainless steel disc, side outlet and lifting lever, 250# CWP. Acceptable Manufacturers: Consolidated Div. of Dresser Ind. Series 1900, Kunkle #463, Keckley Type 41.
- B. RV-4: (Domestic Hot Water) Pressure and Temperature relief, cast bronze body and internal parts, stainless steel spring, test lever, threaded inlet and outlet. Maximum setting of 150 psi and 210F temperature. Capacities ASME certified and labeled. Acceptable Manufacturers: Cash Series FV, Watts #40, #120, #N240, #340.

PART 3 - EXECUTION

3.01 INSTALLATION AND APPLICATION

- A. Coordinate construction to receive drains at required invert elevations.
- B. Install all items per manufacturer's instructions.
- C. Water Hammer Arresters:
 - 1. Install water hammer arresters in accessible locations. Provide access doors as required. Coordinate type with Architect/Engineer/Owner.
 - 2. Water hammer arrestors shall be installed in cold and hot water lines upstream of all plumbing fixtures or equipment, with a quick acting valve or multiple quick acting valves. Quick acting valves shall be defined as solenoid actuated valves, manual flush valves, sensor activated faucets and flush valves, squeeze handle spray faucets, and other similar type valves.
 - 3. Install multiple water hammer arrestors in toilet group branch piping greater than 20 feet in developed length from the cold and hot water mains.
- D. Cleanouts:
 - 1. Provide cleanouts where shown on the drawings and as required by code, but in no case farther apart than 50 feet in pipe less than 6" size and 100 feet apart in 6" and larger pipes inside the building. Provide cleanouts at bases of all sanitary and storm risers as shown on the drawings and as required by code.
 - 3. Provide a cleanout at the upstream end of a horizontal waste pipe in a plumbing chase serving multiple plumbing fixtures; for example a bank of water closets or lavatories.
 - 4. Provide cleanouts on the branch line connected to individual plumbing fixtures as required by code; for example just below a sink, lavatory or urinal.
 - 5. Extend underfloor cleanouts up to the floor with long sweep elbows.
 - 6. Install a full size, two-way cleanout within 5 feet of the foundation inside or outside of building.
 - 7. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.
 - 8. Wall cleanouts shall be installed above the flow line of the pipe they serve, but no less than 12" above the finished floor.
- E. Floor Drains and Floor Sinks:
 - 1. Drains in upper floors shall have a flashing of EPDM or similar membrane sheet. The sheet shall be at least 36" X 36" square with the drain in the center. Clamp membrane in auxiliary clamping ring of floor drain.

2. Use alternate sealing method when installing drains in existing floor slabs.
3. Coordinate sloping requirements with the architectural plans and specifications.
4. Top of floor drain and sink grate/strainer shall not extend above the finished floor elevation. Grate/strainer shall be installed flush with surrounding finished floor. Should the Plumbing Contractor believe this presents a conflict with code, the issue should be evaluated before installation of the floor drain or sink begins. Proceeding with installing a floor drain or sink raised above the finished floor without prior approval will result in the Contractor being required to remove the drain or sink in question and reinstall it at the approved elevation.

F. Hub Drains and Standpipes:

1. The top of a hub drain/standpipe shall extend above the finished floor elevation. Refer to drawings for dimensions above the finished floor.
2. Access shall be provided to drains and standpipes for rodding.

G. Roof Drains:

1. Roof drains shall have bearing pans.
2. Provide auxiliary support steel under drains as required to prevent movement of the drain.
3. All roof drains shall have underdeck clamps or a manufacturer provided attachment method for the specific roof style the drain is installed in.
4. Drains in built-up roofing systems shall have a 36" x 36" flashing.

H. Backflow Preventer:

1. Provide an air gap fitting and piping to drain. On 2-1/2" and larger units, install a tail piece from air gap fitting to drain to prevent water from spraying out of drain air gap receptor. Maintain air gap distance required by Code.
2. Units shall be field tested and tagged in accordance with manufacturer's instructions and applicable codes by a certified tester before initial operation.
3. Install unit between 12" and 60" above finish floor in a location that is accessible for annual testing and maintenance.

I. Balancing Valves:

1. Install balancing valves with straight, unobstructed pipe section both upstream and downstream as required, per manufacturer's installation instructions.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 11 23 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Domestic Water In-Line Circulators.

1.02 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00.
- B. Submit certified pump performance curves with pump and system operating point plotted. Include NPSH curve when applicable.
- C. Pumps with motors operating above the RPM the pump curves are based on shall have impellers trimmed to deliver GPM and head scheduled.
- D. Submit certification that pumps, accessories, and components will withstand seismic forces defined in Section 22 05 50. Include the following:
 - 1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Statically and dynamically balance rotating parts.
- B. Construction shall permit complete servicing without breaking piping or motor connections.
- C. Pumps shall operate at 1750 rpm unless specified otherwise.
- D. Pump connections shall be flanged, whenever available.
- E. Domestic hot water pumps shall be suitable for 225F water.
- F. Motors shall comply with Section 22 05 13.

- G. Submitted pump selections must have a diameter impeller that meets or exceeds the scheduled pump. The inlet and discharge pipe sizes shall also meet or exceed the scheduled pump.

2.02 DOMESTIC WATER IN-LINE CIRCULATORS

- A. Provide pumps as specified on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General Installation Requirements:

1. Install all products per manufacturer's recommendations.
2. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

- B. In-Line Pump:

1. Support in-line pumps individually so there is no strain on the piping. Support pump so no weight is carried on pump casings. Install with a minimum of five diameters of straight pipe on pump suction and discharge.
2. Ensure pumps operate at specified fluid temperatures without vapor binding or cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.
3. Pumps shall be factory aligned. If alignment is not satisfactory, as determined by the Architect/Engineer, manufacturer shall provide a factory trained representative to field align the shafts.
4. Alignment shall be inspected and approved by a factory trained representative. If alignment is not satisfactory, representative shall field align this shaft.

- C. Pump without VFD or ECM:

1. For pumps not powered by a VFD, trim impeller to meet maximum operating conditions. Coordinate final trimmed diameter with Testing, Adjusting, and Balancing Contractor and Architect/Engineer.

END OF SECTION

SECTION 22 14 29 - SUMP PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sump Pumps.

1.02 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00.
- B. Submit certified pump performance curves with pump and system operating point plotted. Include NPSH curve when applicable.
- C. Pumps with motors operating above the RPM the pump curves are based on shall have impellers trimmed to deliver GPM and head scheduled.
- D. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.
- E. Submit certification that pumps, accessories, and components will withstand seismic forces defined in Section 22 05 50. Include the following:
 - 1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Statically and dynamically balance rotating parts.
- B. Construction shall permit complete servicing without breaking piping or motor connections.
- C. Pumps shall operate at 1750 rpm unless specified otherwise.
- D. Pump connections shall be flanged, whenever available.
- E. Motors shall comply with Section 22 05 13.

- F. The discharge pipe sizes shall meet or exceed the scheduled pump.

2.02 SUMP PUMPS

- A. Provide pumps as specified on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings and accessories.
- C. Support piping so weight of piping is not supported by pumps.
- D. Mount control panel on adjacent wall within required distance for cables and wiring. Provide unistrut mounting frame for the control panel if wall space is not available. Properly anchor frame to floor.
- E. Ensure pumps operate at specified fluid temperatures without vapor binding or cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.
- F. Pumps shall be factory aligned. If alignment is not satisfactory, as determined by the Architect/Engineer, manufacturer shall provide a factory trained representative to field align the shafts.
- G. Sump pumps that discharge to storm shall be installed with the top of the sump basin 2" above floor level. A 2" high x 4" wide concrete curb around the perimeter of the basin lid may be used in lieu of raising the entire sump basin.
- H. Set submersible sump pumps on basin/pit floor. Make direct connections to storm drainage piping.
- I. Install sump pump basins and connect to drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install cover so top surface is flush with finished floor.

END OF SECTION

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water Heaters.

1.02 QUALITY ASSURANCE

- A. Products and installation of specified products shall conform to recommendations and requirements of the following organizations:
 - 1. American Gas Association (AGA).
 - 2. National Sanitation Foundation (NSF).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 5. National Electrical Manufacturers' Association (NEMA).
 - 6. Underwriters' Laboratories (UL).
- B. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1 when tested in accordance with DOE 10 CFR, ANSI Z21.10.1 and ANSI Z21.10.3.
- C. Conform to ASME Section VIII for construction of water heaters and heat exchangers. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.

1.03 REFERENCES

- A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. ANSI/ASME Section 8D - Pressure Vessels.
- C. ANSI Section 21.10.1 or Section ANSI 21.10.3 - Gas Water Heaters Ratings 75,000 BTU per Hour and Less.
- D. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.
- E. ANSI/NFPA 54 - National Fuel Gas Code.
- F. ANSI/NFPA 70 - National Electrical Code.
- G. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.
- H. ASSE 1005 - Water Heater Drain Valves, 3/4" Iron Pipe Size.
- I. UL 174 - Household Electric Storage Tank Water Heaters.

1.04 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00.

- B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
- C. Include heat exchanger dimensions, size of tappings, and performance data.
- D. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- E. For equipment connected to an electric power source, submit short circuit rating (SCCR) of integrated unit.
- F. Submit manufacturer's installation instructions including control and electrical power/controls wiring diagrams.
- G. Submit manufacturer's certificate that pressure vessels meet or exceed specified requirements.
- H. Submit operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- I. Submit certification that, water heaters, accessories, and components will withstand seismic forces defined in Section 22 05 50. Include the following:
 - 1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 REGULATORY REQUIREMENTS

- A. Water heaters shall conform to AGA, ANSI/NFPA 54, ANSI/NFPA 70, ANSI/UL 1453 as applicable.
- B. Conform to ANSI/ASME Section 8 Division 1 for fabrication of steel pressure vessels.
- C. Conform to ANSI/ASME Section 10 for manufacture of fiber-reinforced plastic pressure vessels.

PART 2 - PRODUCTS

2.01 WATER HEATERS

- A. All water heaters shall be as scheduled on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all items in accordance with manufacturer's instructions.

3.02 WATER HEATER INSTALLATION

- A. Install water heaters on concrete bases. Coordinate sizes and locations of concrete bases. Refer to Section 22 05 29.
- B. Install water heaters level and plumb, according to drawings, manufacturer's instructions, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend drain piping full size from relief valve and discharge by positive air gap onto closest floor drain. Discharge pipe material shall be same as domestic water piping.
- D. Install gas water heaters according to NFPA 54.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. All plumbing fixtures.

1.02 REFERENCES

- A. ANSI A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
- D. ANSI A112.19.2M - Vitreous China Plumbing Fixtures.
- E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
- F. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- H. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.
- I. AHRI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
- J. ASSE 1002 - Water Closet Flush Tank Ball Cocks.
- K. Americans with Disabilities Act (ADA), Title III.
- L. The Energy Policy Act (EPAct) of 2005.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 22 05 00. Submittals shall include fixture carriers for record purposes only. Architect/Engineer does not review or approve carriers except for manufacturer.
- B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. For fixtures and trim requiring electrical connections, submit product data indicating general assembly, components, electrical power/controls wiring diagrams, and service connections.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All fixtures shall be as shown on the drawings and as scheduled in the plumbing material list. Additional requirements below:

- B. All vitreous china fixtures shall be from the same manufacturer where possible.
- C. All lavatory and sink trim shall be from the same manufacturer where possible.
- D. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not contain more lead than allowed per the latest State or Federal Act.
- E. P-Traps and Tailpieces:
 - 1. Lavatories:
 - a. Accessible Type: 1-1/4" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
 - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
 - 2. Sinks:
 - a. Accessible Type: 1-1/2" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
 - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
 - 3. Acceptable Manufacturers:
 - a. McGuire
 - b. Keeney
 - c. Dearborn Brass
 - d. Zurn
 - e. Chicago Faucet
- F. Insulation Covers and Enclosures for Accessible Lavatories and Sinks:
 - 1. Premanufactured cover for P-trap, stop valves, and supply lines.
 - a. 1/8" thick vinyl construction, paintable, tool free installation,
 - b. Acceptable Manufacturers:
 - 1) Truebro (Lav Guard 2)
 - 2) Plumberex (Pro-Extreme)
 - 3) McGuire (Prowrap)
 - 4) Buckaroos Inc.
 - 5) Zurn
 - 2. Premanufactured rigid enclosure for concealing lavatory P-trap, stop valves, and supply lines,
 - a. Rigid, high impact PVC, paintable, stainless steel fasteners for anchoring and removal.
 - b. Acceptable Manufacturers:
 - 1) Truebro (Lav Shield #2018)
 - 2) Zurn (Z6900-VG)
 - 3) Approved equal
 - 3. Premanufactured rigid enclosure for concealing sink P-trap, stop valves, supply lines, garbage disposal, etc.

- a. Rigid, high impact PVC, white or beige (Color by architect), paintable, 36" or 42" widths, stainless steel fasteners for anchoring and removal.
- b. Acceptable Manufacturers:
 - 1) Truebro (Basin Guard)
 - 2) Approved equal

G. Angle Stops and Supplies:

- 1. Lavatories, Sinks and Tank Type Water Closets:
 - a. Lead-free, 3/8" chrome plated brass, quarter turn ball valve type with loose key stops, solder or threaded connection type.
 - b. Lead-free, 3/8" chrome plated soft copper risers or stainless steel braided reinforced PVC hose.
 - c. Acceptable Manufacturers:
 - 1) McGuire
 - 2) BrassCraft
 - 3) Keeney
 - 4) Zurn
 - 5) Chicago Faucet

H. Wall Hung Fixture Carriers:

- 1. Material: All Metal, ASME/ANSI A112.6.1M.
- 2. Lavatory carrier shall be rated to support 250 lbs unless noted otherwise on the drawings.
- 3. Water closet carrier shall be rated to support 500 lbs unless noted otherwise on the drawings
- 4. Manufacturers:
 - a. Zurn
 - b. JR Smith
 - c. Wade
 - d. Josam
 - e. Watts
 - f. Mifab
 - g. Sun Drainage Products
 - h. Sioux Chief

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation Requirements:

- 1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- 2. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.
- 3. Provide fixtures with supply lines, stop valves, reducers, escutcheons, and any other items required for a complete and operational plumbing fixture assembly.
- 4. Install components level and plumb.

5. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound. Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.
 6. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water. Refer to DIVISION 7 for "Caulking" requirements.
 7. Refer to Plumbing Material List for fixture mounting heights.
 8. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
- B. Wall-Mounted Fixture Requirements:
1. All wall-mounted fixtures shall have compatible carriers designed for their intended service and suitable for the space available and configuration of fixtures. All carriers shall extend to the floor and be anchored to the slab as intended by the carrier manufacturer.
- C. Floor-Mounted Fixture Requirements:
1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.
- D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:
1. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
 2. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
 3. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.
- E. ADA Accessible Exposed Sink and Lavatory Trim:
1. All exposed sink and lavatory traps, piping and angle stops installed at accessible sink and lavatory locations shall include offset style drain tailpiece, p-trap installed near and parallel with back wall, and insulation kit specially manufactured for this installation. Armaflex with duct tape is not acceptable.
- F. ADA Accessible Water Closet Requirements:
1. Handicapped accessible water closet flush valve or flush tank handles shall be on the left hand or right hand side of the fixture, whichever is nearer to the center of the stall.
 2. Coordinate flush valves in handicap accessible locations with grab bars installed by the General Contractor. Make modifications as necessary to flush valve piping to avoid conflict with grab bars. Common solutions include shortened or offset vacuum breaker tailpieces.
- G. Bathtubs and Shower Requirements:
1. All acrylic and fiberglass bathtubs and showers shall have a non-shrink grout or manufacturer-approved material installed between the finished floor and floor of the fixture to prevent damage caused by deflection.

2. All rough-in pockets for showers and tubs located in basement floor installations shall be filled in with concrete and sealed tight.

3.02 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

3.03 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping connections in accordance with table on plumbing drawings of minimum sizes for particular fixtures.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. All plumbing fixtures.

1.02 REFERENCES

- A. ANSI A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
- D. ANSI A112.19.2M - Vitreous China Plumbing Fixtures.
- E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
- F. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- H. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.
- I. AHRI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
- J. ASSE 1002 - Water Closet Flush Tank Ball Cocks.
- K. Americans with Disabilities Act (ADA), Title III.
- L. The Energy Policy Act (EPAct) of 2005.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 22 05 00. Submittals shall include fixture carriers for record purposes only. Architect/Engineer does not review or approve carriers except for manufacturer.
- B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. For fixtures and trim requiring electrical connections, submit product data indicating general assembly, components, electrical power/controls wiring diagrams, and service connections.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All fixtures shall be as shown on the drawings and as scheduled in the plumbing material list. Additional requirements below:

- B. All vitreous china fixtures shall be from the same manufacturer where possible.
- C. All lavatory and sink trim shall be from the same manufacturer where possible.
- D. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not contain more lead than allowed per the latest State or Federal Act.
- E. P-Traps and Tailpieces:
 - 1. Lavatories:
 - a. Accessible Type: 1-1/4" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
 - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
 - 2. Sinks:
 - a. Accessible Type: 1-1/2" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
 - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
 - 3. Acceptable Manufacturers:
 - a. McGuire
 - b. Keeney
 - c. Dearborn Brass
 - d. Zurn
 - e. Chicago Faucet
- F. Insulation Covers and Enclosures for Accessible Lavatories and Sinks:
 - 1. Premanufactured cover for P-trap, stop valves, and supply lines.
 - a. 1/8" thick vinyl construction, paintable, tool free installation,
 - b. Acceptable Manufacturers:
 - 1) Truebro (Lav Guard 2)
 - 2) Plumberex (Pro-Extreme)
 - 3) McGuire (Prowrap)
 - 4) Buckaroos Inc.
 - 5) Zurn
 - 2. Premanufactured rigid enclosure for concealing lavatory P-trap, stop valves, and supply lines,
 - a. Rigid, high impact PVC, paintable, stainless steel fasteners for anchoring and removal.
 - b. Acceptable Manufacturers:
 - 1) Truebro (Lav Shield #2018)
 - 2) Zurn (Z6900-VG)
 - 3) Approved equal
 - 3. Premanufactured rigid enclosure for concealing sink P-trap, stop valves, supply lines, garbage disposal, etc.

- a. Rigid, high impact PVC, white or beige (Color by architect), paintable, 36" or 42" widths, stainless steel fasteners for anchoring and removal.
- b. Acceptable Manufacturers:
 - 1) Truebro (Basin Guard)
 - 2) Approved equal

G. Angle Stops and Supplies:

1. Lavatories, Sinks and Tank Type Water Closets:

- a. Lead-free, 3/8" chrome plated brass, quarter turn ball valve type with loose key stops, solder or threaded connection type.
- b. Lead-free, 3/8" chrome plated soft copper risers or stainless steel braided reinforced PVC hose.
- c. Acceptable Manufacturers:
 - 1) McGuire
 - 2) BrassCraft
 - 3) Keeney
 - 4) Zurn
 - 5) Chicago Faucet

H. Wall Hung Fixture Carriers:

- 1. Material: All Metal, ASME/ANSI A112.6.1M.
- 2. Lavatory carrier shall be rated to support 250 lbs unless noted otherwise on the drawings.
- 3. Water closet carrier shall be rated to support 500 lbs unless noted otherwise on the drawings
- 4. Manufacturers:
 - a. Zurn
 - b. JR Smith
 - c. Wade
 - d. Josam
 - e. Watts
 - f. Mifab
 - g. Sun Drainage Products
 - h. Sioux Chief

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Installation Requirements:

- 1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- 2. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.
- 3. Provide fixtures with supply lines, stop valves, reducers, escutcheons, and any other items required for a complete and operational plumbing fixture assembly.
- 4. Install components level and plumb.

5. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound. Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.
 6. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water. Refer to DIVISION 7 for "Caulking" requirements.
 7. Refer to Plumbing Material List for fixture mounting heights.
 8. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
- B. Wall-Mounted Fixture Requirements:
1. All wall-mounted fixtures shall have compatible carriers designed for their intended service and suitable for the space available and configuration of fixtures. All carriers shall extend to the floor and be anchored to the slab as intended by the carrier manufacturer.
- C. Floor-Mounted Fixture Requirements:
1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.
- D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:
1. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
 2. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
 3. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.
- E. ADA Accessible Exposed Sink and Lavatory Trim:
1. All exposed sink and lavatory traps, piping and angle stops installed at accessible sink and lavatory locations shall include offset style drain tailpiece, p-trap installed near and parallel with back wall, and insulation kit specially manufactured for this installation. Armaflex with duct tape is not acceptable.
- F. ADA Accessible Water Closet Requirements:
1. Handicapped accessible water closet flush valve or flush tank handles shall be on the left hand or right hand side of the fixture, whichever is nearer to the center of the stall.
 2. Coordinate flush valves in handicap accessible locations with grab bars installed by the General Contractor. Make modifications as necessary to flush valve piping to avoid conflict with grab bars. Common solutions include shortened or offset vacuum breaker tailpieces.
- G. Bathtubs and Shower Requirements:
1. All acrylic and fiberglass bathtubs and showers shall have a non-shrink grout or manufacturer-approved material installed between the finished floor and floor of the fixture to prevent damage caused by deflection.

2. All rough-in pockets for showers and tubs located in basement floor installations shall be filled in with concrete and sealed tight.

3.02 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

3.03 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping connections in accordance with table on plumbing drawings of minimum sizes for particular fixtures.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 Scope of Work

- A. The Contractor shall provide all materials, equipment and labor necessary to install and set into operation a complete mechanical systems as shown on the engineering drawings and as specified herein.

1.2 Quality Assurance

- A. See the General and Supplementary General Conditions.
- B. All work shall be in accordance with State Code and Underwriter's Regulations. Minimum requirements shall be the State Plumbing, Mechanical, Gas, and Energy Code.
- C. Wherever the words "Approved", "Approval", or "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- D. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- E. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer ten (10) days before the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted. The General Conditions will be followed for substitutions after award of the contract.

1.3 Submittals

- A. See General and Supplementary General Conditions.
- B. Within twenty days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval
- C. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.

1.4 Product Delivery, Storage and Handling

- A. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.

- B. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- C. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

1.5 Work Conditions and Coordination

- A. The Contractor shall review the electrical plans to establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrician.
- B. Electrical work shall be in accordance with State codes, and as specified in Division 16 contained herein.
- C. Pipe chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- D. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

1.6 Guarantee

- A. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturers warranty period.
- B. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the finals acceptance of the work an shall replace such defective materials or workmanship without cost to the owner.
- C. The contractor shall provide a five year compressor warranty for all refrigeration compressors from date of system acceptance.

PART 2 - PRODUCT

- 2.1 Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Material and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2.2 The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Nameplates shall be fastened with pan head tapping screws.

PART 3 - EXECUTION

3.1 Inspection

- A. This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.

3.2 Installation

- A. All work shall be performed in a manner indicating proficiency in the trade.
- B. All pipes shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- D. All finishing shall be by the General Contractor.
- E. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls, above grade, required for passage of all pipes required to support his equipment.
- F. All fixtures shall be accurately roughed in according to the manufacturer's installation dimensions so that no offset adaptors, flexible connections or other improvising are necessary. All incorrect work shall be torn out and corrected and walls and floors patched.

3.3 Performance

- A. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
- B. Rock excavation shall be defined in the Supplementary General Conditions. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

3.4 Erection

- A. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

3.5 Adjust and Clean

- A. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for intended service. In no event shall nameplates be painted.
- C. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract.

3.6 Maintenance and Operating Manual

- A. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data

intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:

1. Index and page numbers.
 2. Certificate of substantial completion.
 3. A summary sheet of warranties with the dates noted and a copy of all warranties.
 4. List of all subcontractors and suppliers with names, addresses and phone numbers.
 5. Certified testing and balancing report.
 6. All submittal data and shop drawings.
- B. The O & M manuals shall be installed in 3 ring heavy back note books with the name of the building and the words, "Operations and Maintenance Manuals" permanently affixed to the cover and spine.
- C. The operating and maintenance manuals shall be submitted to the Engineer (2) weeks before the pre-final inspection, for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

3.7 As Built Documents

- A. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent upon receipt of these as-built plans.

3.8 Training

- A. The contractor shall provide owner training in not less than two sessions on the operation and maintenance of the systems installed by this contract
- B. Sessions shall be digitally recorded and turned over to owner
- C. Contractor shall provide record of individuals trained.

END OF SECTION 230500

SECTION 230513 - ELECTRICAL WORK (MECHANICAL)

PART 1 - GENERAL

- 1.1 This Contractor shall be responsible for the entire control system and control connections to all equipment installed as part of his contract.
- 1.2 Wiring from disconnect switches, junction boxes, etc. up to mechanical equipment shall be by this contractor. Final electrical connections to mechanical equipment shall be by this contractor.
- 1.3 All power and control wiring shall be in conduits.
- 1.4 All electrical work shall be performed by a licensed electrician.
- 1.5 All electrical work shall be in accordance with the State Building Code and all its supplements and the latest edition of the National Electrical Code.

PART 2 - PRODUCT

- 2.1 All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
- 2.2 Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
- 2.3 All conductors and conduits shall be sized as noted on the plans or as required per NEC.

PART 3 - EXECUTION

- 3.1 All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
- 3.2 Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid- Tite" conduit. Connection to other equipment shall be made with rigid conduit.
- 3.3 Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 230513

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230529 - PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

- 1.1 This Section includes all hangers and supports, etc. as may be required to provide a complete piping system.
- 1.2 The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.
- 1.3 Refer to specification Section 232113 for piping.

PART 2 - PRODUCT

- 2.1 Piping shall be as stated in Piping Section(s).
- 2.2 Hangers and supports shall be as manufactured by B-Line Systems, Inc., PHD Manufacturing, Empire, or Modern Support Devices.

PART 3 - EXECUTION

- 3.1 In no case shall this Contractor be allowed to cut or reduce the specified insulation covering to allow the application of a smaller hanger than required.
- 3.2 Hangers shall be spaced as dictated by North Carolina Mechanical Code.
- 3.3 Hangers shall be provided at each change in direction.
- 3.4 Vertical risers shall be supported at each floor, 5 feet on center, and/or at changes in direction of pipe.
- 3.5 Do not support piping from bar joist bridging and/or roof deck.
- 3.6 Supports shall have rubber insert or painted surface to prevent dissimilar metals from direct contact.
- 3.7 Contractor shall provide threaded rod attachment to structure as required for load at support.
- 3.8 Only plumbing work shall be supported by hangers provided by this contractor.

END OF SECTION 230529

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230548 - VIBRATION ISOLATION

PART 1 - GENERAL

- 1.1 All equipment having rotating or moving parts shall have vibration isolators to eliminate transmission of objectionable noise to other material or equipment.
- 1.2 Isolators shall be selected for the use intended and shall be approved by the Engineer.

PART 2 - PRODUCT

- 2.1 Duct Connectors
 - A. Flexible connections shall be provided between metal ductwork and motorized housings.
 - B. Flexible fabric duct connectors shall be twenty-ounce, fire retardant, UL labeled, 10" maximum length, Ventfab or approved equal.
- 2.2 Pipe Connectors
 - A. Flexible pipe connections shall be braided stainless steel with enlarged connections by Mctraflex or approved equal.
- 2.3 Supports
 - A. Neoprene pads, springs, hangers, isolation pads, etc., where required, shown or indicated, shall be by Consolidated Kinetics Company' Vibration Mountings, Inc.; Vibration Eliminator Company; or approved equal.

PART 3 - EXECUTION

- 3.1 Flexible connections shall be made according to the manufacturer's recommendations utilizing angles, bolts, clips or other fastenings necessary for securing the material to the duct pipe and the equipment.
- 3.2 All vibration isolation equipment shall be coordinated with equipment specified and installed according to manufacturer's recommendations.

END OF SECTION 230548

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230553 - IDENTIFICATION OF HVAC COMPONENTS

PART 1 - GENERAL

- 1.1 This section includes insulation for piping, ductwork, and equipment, as shown on the plans.
- 1.2 All coverings, and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.

PART 2 - PRODUCT

PART 3 - EXECUTION

3.1 Equipment

- A. All HVAC equipment, including air handlers, fans and pumps shall be properly identified with equipment identification, equipment controlled, electrical ratings and date of installation.
- B. Equipment shall be clearly identified with engraved phenolic plates securely fastened to the equipment with sheet metal screws. Phenolic plates shall be black background and white lettering.
- C. All serviceable equipment (fans, reheat coils, VAV boxes, etc.) located above ceilings or other concealed spaces shall clearly identified on an adjacent finished surface below service space. Label shall be engraved phenolic plate with white background and black letters. Label shall list name of equipment.
- D. Equipment labeling shall be coordinated with owner to match identification used by Building Automaton System.

3.2 Ductwork

- A. Paint all exposed ductwork insulation in mechanical rooms white. Ductwork exposed in finished spaces shall be painted as shown on architectural plans.

Duct System	Color Stencil Identification	Label Color	Lettering Color
Supply Ductwork	SUPPLY AIR	Green	White
Return Ductwork	RETURN AIR	Blue	White
OA Ductwork	OUTSIDE AIR	Blue	White
Exhaust Ductwork	EXHAUST	Yellow	Black

3.3 Piping and Valves

A. Valve Identification

1. All valves shall be tagged brass valve tags with chains for isolation and control valves.
2. Provide valve tag chart in the O&M manual.

3. Provide famed valve tag chart with lexan cover mounted in each mechanical room. Chart shall include all valves in that room.
 4. Include the tag numbers in the as-built drawings.
- B. All piping shall be provided with identification in accordance with ANSI A13.1-1981 standards. Markers shall be located at each wall, floor or ceiling penetration, and at every 20 ft. Markets shall be fully legible from floor level showing medium contained pipe, and direction flow. Stenciling as indicated below will be acceptable in lieu of markers.
- C. All exposed piping in mechanical rooms shall be painted and marked as listed below:
- | Piping System | Color | Stencil Identification | Label Color | Lettering Color |
|---------------|--------|------------------------|-------------|-----------------|
| Natural Gas | Yellow | GAS | Yellow | Black |
- D. Pipe identification shall contrast in color to the pipe colors and be easily readable. The width of color bands should be equal to the size of the stencil indicated below.
- E. For insulated pipe systems, stencil sizes are as follows:
1. For pipes up to 1 inch, use 1/2-inch letters.
 2. For pipes 1 inch to 2 inches, use 3/4-inch letters.
 3. For pipes 2 inches to 4 inches, use 1 1/4-inch letters
 4. For pipes 4 inches to 6 inches, use 1 1/4-inch letters.
 5. For pipes above 6 inches, use 4-inch letters.
- F. f. For un-insulated systems, stencil sizes are as follows:
1. For pipe diameters up to 1 inch, use 1/2-inch letters.
 2. For pipe diameters from 1 inch to 2 inches, use 1-inch letters.
 3. For pipe diameters from 2 inches to 6 inches, use 2-inch letters.
 4. For pipe diameters over 6 inches, use 3-inch letters.

END OF SECTION 230553

SECTION 230593 - TESTING AND BALANCING

PART 1 - GENERAL

1.1 Section Includes

A. Testing, Adjusting, and Balancing:

1. Air condition equipment, including air distribution devices, supply ducts, air handling units, condensing units, fans, coils, and related equipment.
2. Hydronic systems, including pumps, water distribution systems, chillers, boilers, heat exchangers, coils, and related equipment.

1.2 References

A. American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE)

1. Standard 111-2008 – Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-conditioning and Refrigeration Systems.
2. Applications Handbook 2019, Chapter 39 – Testing, Adjusting, and Balancing

B. Testing, Adjusting and Balancing Bureau (TABB) – International Standards for Environmental Systems Balance.

C. Sheet Metal and Air Conditioning Contractors' National Standards for Total System Balance.

D. Associated Air Balance Council (AABC) – National Standards for Total System Balance.

E. National Environmental Balancing Bureau (NEBB) – Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

1.3 Definitions

A. Adjusting: Varying of system flow by modifying settings of dampers and valves, in combination with varying fan speeds to obtain optimum operating conditions for the entire system.

B. Balancing: Proportioning of air and hydronic flows through system mains, branches and terminal devices using standardized procedures to obtain specified air or hydronic flow while imposing the least amount of restriction on the HVAC system.

C. Testing: Use of specialized and calibrated instruments to measure temperatures, pressures, rotational speeds, electrical characteristic, air and hydronic flow in velocities or quantities used in evaluating the performance of an HVAC system.

1.4 Coordination

A. The testing, adjusting and balancing Contractor shall coordinate his work with the mechanical system and temperature control system installing Contractors to accomplish coordination and verification of system operation and readiness for testing, adjusting and balancing.

B. Coordinate and assist CxP with all verification activities including providing all required sampling data necessary for the commissioning process.

1.5 Submittals

A. Qualification Statements:

1. Submit company's certification documents, including:
2. Contractor Certification:
3. Supervisor Certification
4. Technician Certification
5. Submit name of testing agency to Owner within thirty (30) days on Notice to Proceed.
6. Submit list of projects completed by testing agency of similar size, scope and equipment. Include name of Contractor and building Owner contacts.
7. Submit a certification letter stating that the TAB agency is an independent entity not owned in part or in whole by any subcontractor employed on the current project.

B. Reports:

1. Deficiency Report: Following examination of installed system, prior to balancing, submit report indicating system deficiencies that would prevent proper testing, adjusting and balancing of systems and equipment to meet specified performance.
2. TAB Report: Submit a copy of the complete testing, adjusting and balancing report to FMC Project Manager and RECS Atlanta Staff Engineer via email when it becomes available. Report shall include any drawings indicating air outlets, thermostats and equipment identified to correspond with data sheets.
3. Reports shall be on TABB/SMACNA (NEBB or AABC), forms that indicate information addressing each of the testing methods, readings and adjustments.

C. Closeout Submittals:

1. Provide complete copy of testing, adjusting and balancing report. Include report in operation and maintenance manual.

1.6 Quality Assurance

A. Qualifications:

1. Testing and balancing shall be performed by a testing agency who specializes in testing, adjusting and balancing of heating, ventilating, air-moving equipment, air-conditioning systems and hydronic systems, and has a minimum of one (1) year experience.
2. Testing agency shall have successfully completed a minimum of five (5) projects, similar in size and scope.
3. Testing agency shall be a certified member of TABB (AABC and/or NEBB).
4. Maintain a copy of applicable standards at the project site.

B. Certifications:

1. TAB Technician shall be certified by a nationally recognized certifying agency (AABC and/or NEBB).
2. Perform total system balance in accordance with Testing, Adjusting and Balancing Bureau (TABB) – Quality Assurance Program for Environmental Systems Balance, and (AABC National Standards for Field Measurement and Instrumentation and/or NEBB Quality Assurance Program – Conformance Certification).

C. Project Conditions

1. Testing, adjusting and balancing shall commence after the HVAC systems installation is complete and in working order. Associated areas of general construction shall be in place including interior and exterior doors, windows, walls, ceilings and existing conditions.

D. Special Warranty

1. Provide warranty for period of ninety (90) days following physical occupancy of building, during which time the Owner may request a re-check of up to 10% of total number of terminals, or resetting of any outlet, coil or device listed in the test report. This period of time shall be no longer than 180 days after submission of the completed report.
2. Warranty shall meet the requirements of the following program(s):
 - a. TABB – Quality Assurance Program
 - b. AABC – National Performance Guarantee
 - c. NEBB – Conformance Certification

PART 2 - PRODUCT

PART 3 - EXECUTION

- 3.1 Prior to commencing testing, adjusting and balancing of environmental system(s), verify the following conditions; if deficiencies are evident, submit Deficiency Report to Engineer. Do not begin testing, adjusting and balancing of environmental system until deficiencies have been remedied.

- A. Systems are started and operating in a safe and normal condition.
- B. Temperature control systems are installed, complete, and operable.
- C. Automatic and manual dampers are operable and fully open.
- D. Thermal overload protection is in place for fans, pumps, chillers and other equipment.
- E. Start up air filters are removed.
- F. Final filters are clean and properly installed.
- G. Duct and fan systems are clean.
- H. Fans are rotating correctly.
- I. Fire and volume dampers are in place and open.

- J. Air coils fins are cleaned and combed.
- K. Access doors are closed and duct end caps are in place.
- L. Air outlets are installed and connected.
- M. Leak testing on duct system has been performed in accordance with SMACNA Standards, or as specified.
- N. Gauges and/or test parts are properly located for balancing.
- O. Service and balance valves are fully open.

3.2 Site Tolerances

- A. Air Handling Systems: Adjust to within plus 10 percent of outlet total plus allowable leakage rate.
- B. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design for the space.

3.3 Air System Procedure

- A. Adhere to the following procedure:
 - 1. TABB – HVAC Testing, Adjusting and Balancing International Standards; with particular focus on the following chapters:
 - 2. Preliminary TABB procedures
 - 3. General air systems TABB procedures
- B. TABB procedures for specific (VAV, CAV, Multizone, Dual duct, etc.) air systems
- C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) HVAC Systems – Testing, Adjusting and Balancing.
- D. NEBB – Procedural standards for TAB of environmental systems.
- E. AABC – National standards for total systems balance.
- F. Minimum air procedures should include the following:
 - 1. Test and adjust fan RPM to design requirements.
 - 2. Test and record motor full load nameplate rating and actual ampere draw.
 - 3. Test and record system static pressures, fan suction and discharge.
 - 4. Adjust all main supply and return air duct to within tolerances listed in this section of work
 - 5. Test and adjust each diffuser, grille and register. Reading and tests of diffusers, grilles and registers shall include design velocity (FPM) and adjusted velocity, design CFM and adjusted CFM.

6. Test and record outside, mixed air, and discharge temperatures (D.B. for heating cycle, D.B. and W.B. for cooling cycle).
7. In coordination with the ATC contractor, set adjustments of automatically operated dampers to operate as specified, indicated and/or noted.
8. Test and adjust air handling and distribution systems to provide required or design supply, return, outside and exhaust air quantities within design tolerance
9. In air systems employing filters, blank off filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.
10. Make air velocity measurements in ducts by Pitot tube traverse entire cross-sectional area of duct in accordance with SMACNA equal area method or Log Linear method.
11. Measure air quantities at all air inlets and outlets.
12. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels.
13. Vary total system air quantities by adjustments of fan speeds. Provide drive changes recommendations. Vary branch air quantities by damper regulation.
14. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for loading of filters and coils.
15. Adjust outside air automatic dampers. Outside air, return air and exhaust dampers for design conditions within specified tolerances.
16. Where modulating dampers or economizers are provided, take and record measurement at full return air, minimum outside air and 100 percent outside air mode of operation.
17. Verify and record, in the T&B Report, "K" factors for all VAV air terminal devices and air flow stations.

3.4 Adjusting

- A. Recorded data shall represent actual measured or observed conditions.
- B. Permanently mark setting of valves, dampers and other adjustment devices allowing for settings to be restored. Set and lock memory stops.
- C. Leave systems in proper working, replacing belt guards, closing access doors, closing doors to electrical switch boxes and restoring thermostats to specified settings.
- D. Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

END OF SECTION 23059

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 230700 - INSULATION

PART 1 - GENERAL

- 1.1 This section includes insulation for piping, ductwork, and equipment, as shown on the plans.
- 1.2 All insulation, linings, coverings, and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.
- 1.3 Insulation shall be Certainteed, Owens Corning, or Johns-Manville.

PART 2 - PRODUCT

- 2.1 Duct
 - A. Unless otherwise noted in the drawings all rectangular and round air conditioning supply, return, exhaust, and outside air duct shall be externally insulated with 3" thick, 3/4 lb. density foil scrim Kraft jacketed insulation. Joints shall be wrapped with a minimum of 3" wide FSK band of insulation to prevent any possible leakage and condensation. Ducts with widths over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum centers.
 - B. In addition to the duct wrap specified in B1.a of this specification, all low-pressure rectangular supply and return ductwork shall be lined for 15 feet downstream from air handling unit (or up to and including the first 90 degree elbow). Duct liner shall be 1" thick, 2lb. dense, Shuller Permorate Linacoustic HP, or approved equivalent. Coat all exposed leading edges and transverse joints with a fire-retardant adhesive.
 - C. Duct sizes shown are actual duct dimensions. Where ductwork is lined, as noted above, the duct insulation thickness shall be added to the listed ductwork dimensions for final duct size.
 - D. Ductwork located in mechanical rooms shall be wrapped with duct board insulation 2" thickness rigid Fiberglass Owens/Corning or equal, ASTM C 612, 3 pounds per cubic foot density, with Foil reinforced jacket. The board shall be attached with field applied perforated base pins or weld pins applied on 12" centers. Finish shall be 8oz canvas jacket, totally sized with Foster 81-42W or equal lagging adhesive. Corner board shall be used on all edges.
 - E. Ductwork located outside the building shall be wrapped with polyisocyanurate board insulation with, ASTM C 612, for installed R-8 insold value. The board shall be attached with field applied perforated base pins or weld pins applied on 12" centers. Board shall be wrapped with self-adhesive weather barrier equal to Alumaguard. Layer self-adhesive weather type final covering equal to Alumaguard. Slope all flat horizontal surfaces to shed water.
- 2.2 Piping
 - A. All condensate drain piping, make-up water piping, all refrigerant suction piping, and all refrigerant piping exposed on the exterior of the building shall be insulated with 1.5" wall tubular closed cell elastomeric insulation with all joints butted and cemented tight. Insulation shall be Rubatex R-180-FS or equal. Cover exterior insulation with aluminum jacket.

PART 3 - EXECUTION

- 3.1 Insulation shall be installed in accordance with manufacturer's recommendations.

- 3.2 All exterior piping insulation above grade shall be provided with a protective aluminum jacket with a factory-applied asphalt and kraft paper moisture barrier. Aluminum jackets shall be cross-crimped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.106" thick and shall be secured with aluminum or stainless-steel screw; not more than 8" apart.
- 3.3 Any pipe covered prior to leak testing shall be exposed at contractor expense.
- 3.4 Provide 18 gauge 12" length sheet metal saddle at all hangers.
- 3.5 No insulation thickness shall be reduced at hanger.

END OF SECTION 230700

SECTION 230800 – MECHANICAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning

Commissioning is a systematic process of ensuring that all building systems perform interactively according to the owner's project requirements and operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing adjusting and balancing, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper functional performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner's operating personnel are adequately trained.

1.2 RELATED WORK

- A. Section 23 0900 – Instrumentation and Controls for HVAC

1.3 ABBREVIATIONS AND DEFINITIONS

- A. A/E: Architect, Architect/Engineer, Engineer and/or Design-Builder
- B. ASI: Architectural Supplemental Instruction
- C. BAS: Building Automation System
- D. BoD: Basis of Design. A narrative of how the designer plans to achieve the OPR.
- E. CxA: Commissioning Authority
- F. CC: Controls Contractor
- G. CM: Construction Manager
- H. Cx: Commissioning
- I. Cx Plan: Commissioning Plan
- J. DDC: Direct Digital Control System
- K. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents and cannot be corrected in five (5) minutes time.

- L. FT: Functional Performance Test
- M. MC: Mechanical Contractor
- N. O&M: Operation and Maintenance
- O. OPM: Owner Project Manager
- P. OPR: Owner Project Requirement. A dynamic document expressing how the owner expects the building systems to perform upon project completion.
- Q. PC: Prefunctional Checklist
- R. Sub(s): Subcontractors or Prime Contractor
- S. TAB: Test, Adjust and Balance

1.4 MECHANICAL EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

A. Mechanical Systems

1. All variable air volume packaged rooftop units
2. Test, Adjust, and Balance of HVAC air systems.
3. Exhaust Fans

B. Building Automation Systems (BAS)

1. The entire BAS shall be subject to commissioning, including all hardware components, software, networking, programming and engineering services, and controls documentation.
2. Any systems connected to the BAS (monitoring or otherwise) are subject to be commissioned including water meters.

1.5 SUBMITTALS

A. Provide the CxA a copy of the following items, for the systems to be commissioned:

1. Equipment and System Submittals to include, at minimum, the following:
 - a. Equipment Data Sheets
 - b. Performance data
 - c. Manufacturer's pre-startup checklists
 - d. Manufacturer's start-up checklists

- e. Installation Instructions
- 2. Test, Adjust, and Balance (TAB) Reports
 - a. Planning Report - TAB contractor shall submit one copy of planning report (execution plan) to the CxA for review prior to beginning TAB work. At a minimum this report should include:
 - 1) Certifications on all instruments to be used throughout the testing. Certification must be documented within the previous 6 months.
 - 2) Résumés and Certification of individuals who will be balancing the systems.
 - 3) Detailed step-by-step plans for each procedure to be performed by the TAB Contractor.
 - 4) Sample forms to be used for each measurement.
 - b. Initial Test Report – Prior to starting final Balance Phase, submit a copy of the initial test report (TAB punchlist) to the CxA to indicate problem areas to be resolved before final balance is completed.
 - c. Final Report – Submit one copy of final test report to the CxA within 7 days after fieldwork is complete.
- 3. Shop drawings (including any resubmittals required by the A/E)
- 4. Piping - Supply one copy of all hydrostatic pressure test results
- 5. Initial Pre-startup and start-up plan
- 6. Startup Testing Report
 - a. Prepare startup testing report on a per system basis, documenting the results of executed testing plan.
 - b. Copies of all completed test forms and checklists shall be provided.
 - c. List of all outstanding deficiencies and uncompleted items.
- 7. Operational and maintenance documentation
- 8. Training plan and training materials
- 9. As-built documentation

1.6 SEQUENCE OF OPERATIONS

- A. See Mechanical plans for more information.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. Instrumentation required to verify readings and test system and equipment performance shall be provided by Contractor and made available to Commissioning Authority. Refer to respective specification sections for testing procedures.

2.2 Cx WEB-BASED COMMISSIONING TOOL

- A. All web-based software required to verify readings and test system and equipment performance shall be provided by Contractor and made available to Commissioning Authority. Refer to respective specification sections for testing procedures.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Prior to the start of construction, the mechanical and controls contractor will schedule a meeting with the commissioning authority to review the systems to be commissioned, the testing methodology, and other requirements.

3.2 START-UP, PRE-FUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. General

1. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
2. The prefunctional performance test checklists shall be developed by the CxA.

B. Start-up and Initial Checkout Plan

1. The subcontractor responsible for providing and installing the equipment shall develop the full start-up plan by combining the prefunctional checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checkout and inspection of each piece of equipment and a summary statement with a signature block at the end of the checklist.
2. The full start-up plan shall consist of:
 - a. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end
 - b. The manufacturer's normally used field checkout sheets
 - c. Specifically, the mechanical start-up plan shall also include the contractors TAB plan.
3. The contractor submits the full startup plan to the CxA for review and approval.
4. The CxA reviews and approves the procedures and the format for documenting them, noting any plans that need to be added.

C. Execution of Prefunctional Checklists and Startup

1. Two weeks prior to startup, the Subs and vendors schedule startup and checkout with the OPM, CM and CxA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CxA and possibly the A/E will observe the procedures for selected pieces of primary equipment. It is the intent that the commissioning authority will observe the tests during contractor testing. If the contractor does not inform the commissioning authority of testing, the commissioning authority may request the contractor to repeat the test.
3. The CxA will observe the physical start-up of all major systems.
4. For lower-level components of equipment, (e.g., sensors, controllers), the CxA will observe a sampling of the prefunctional and start-up procedures.
5. The Subs and vendors shall execute startup and provide the CM with a signed and dated copy of the completed start-up and prefunctional tests and checklists. The CM reviews for completion and accuracy, then submits to the CxA.
6. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.
7. Completed startup test report must be provided to CxA prior to functional testing.

D. Deficiencies, Non-Conformance and Approval in Checklists and Startup

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully. The procedures form and any outstanding deficiencies shall be provided to the CxA within two days of test completion.
2. The CxA will work with the Subs and vendors to determine what is required to correct outstanding deficiencies and retest deficiencies of uncompleted items. The CxA will involve the PM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to functional testing and demonstration for equipment and system in this division. The functional testing check list shall be developed by the CxA.

B. The general list of equipment and systems to be commissioned is found in section 1.4.

C. Objectives and Scope

1. The objective of functional performance testing is to demonstrate that each system is operating according to the owner's project requirements, documented project program, and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing

process, areas of deficient performance are identified and corrected, improving the operation and function of the systems.

2. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, failures, interlocks, warm-up, safety, etc.) where there is a specified system response. Verifying each sequence in the sequence of operation is required.
3. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
4. The contractor shall supply all personnel and equipment for the demonstration, including, but not limited to, tools, instruments, ladders, lifts, computers, software, cables, etc. Contractor supplied personnel must be competent with and knowledgeable of all project-specific systems, and automation hardware and software. All training documentation, submittals, installation manuals, and O&Ms, shall be at the job site before functional testing commences.

D. Development of Test Procedures

1. The CxA develops specific functional test procedures and forms to verify and document proper operation of each piece of equipment and system. The CxA provides a copy of the test procedures to the A/E, OPM and installing Sub who shall review the tests prior to testing. The A/E and Sub(s) shall point out to the CxA any specific problems related to feasibility, safety, equipment and warranty protection.

E. Coordination and Scheduling

1. The CM shall provide sufficient notice to the CxA regarding the Subs completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests after written notification from the CM and affected Subs. Completed startup testing report must be provided to CxA prior to functional testing. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.
2. In general, functional testing shall not be scheduled until all hardware and software submittals are approved, Prefunctional checklists are approved, and start-up has been satisfactorily completed. Further, mechanical system functional testing shall not be scheduled until the final TAB report is approved and all reported deficiencies by TAB firm are corrected. Scheduling of functional testing shall be done with a minimum of two weeks notice prior to testing. Functional testing of the equipment and systems listed in section 1.4 of this specification section shall not be conducted out of the presence of the CxA and OPM, unless specifically approved to do so in writing by the CxA or OPM. Any functional testing which occurs outside the presence of the CxA or OPM without written authorization to do so will be required to be re-tested at no expense to the owner.

F. Test Methods

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers.

2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair dryer rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout setpoint to be 2°F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

G. Demonstration, Verification and Validation

1. TAB Validation

- a. The air balancing is de-bugged, completed and approved before the CxA completes a TAB validation of air-related and water-related equipment or systems. The CxA will direct a TAB checkout by verifying the values reported in the final TAB report. The contractor shall supply all personnel and equipment for the checkout, including, but not limited to, tools, instruments, ladders, lifts, computers, software, cables, etc. The TAB verification shall verify:
 - 1) Grilles, diffusers, and registers
 - 2) All terminal devices, air and water
 - 3) All main HVAC systems.
 - 4) All exhaust fans

H. Problem Solving

1. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, Subs and A/E.

3.5 OPERATION AND MAINTENANCE MANUALS

- A. In addition to Installation manuals, the contractor shall provide one copy of the Operation and Maintenance Manuals to the CxA for the systems to be commissioned. The O&M Manuals shall be provided to the CxA at least 8 weeks prior to the start of Functional Testing. O&M Manuals shall be in electronic form, the file format shall be Adobe Acrobat readable document. The document shall be formatted to include level 1 bookmarks that link to each main section of equipment.

3.6 TRAINING OF OWNER PERSONNEL

- A. CxA shall document the completion of comprehensive Owner training. Training shall include the understanding of the systems and the operation and maintenance of each major piece of HVAC equipment or system.
- B. Training shall include classroom sessions, if necessary, followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including all HVAC Systems, Controls, Exhaust Fans, etc.

END OF SECTION

SECTION 230900 – INSTRUMENTATION AND CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the scope of work for the Facility Management and Control System that must be installed by a qualified FCMS Contractor and integrated to the Enterprise Server by the Enterprise Developer. This section also coordinates the responsibilities of the Mechanical and Electrical trade contractors pertaining to control products or systems, furnished by each trade, and that will be integrated by this Division.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- C. It is the owner's goal to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

1.2 SCOPE OF WORK

- A. The Facility Management and Control System (FMCS) shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to the owner's local or wide area network, depending on configuration. Each User shall configure a dashboard view of the pertinent data and this view shall be saved for later use. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through a standard Web browser, via the Internet and/or local area network. Each NAC shall communicate to LonMark/LonTalk (IDC), Bacnet (IBC), MODBUS and other open and legacy protocol systems/devices provided under this Division. In addition, from the controller(s) to the device(s) shall communicate to LonMark/LonTalk (IDC), Bacnet (IBC), MODBUS and other open and legacy protocol systems/devices provided under this Division. It is the owner's goal to eliminate any gateway or redundant device(s).
- B. The Facility Management and Control System (FMCS) as provided in this Division shall be a JACE that provides an open automation infrastructure, an open license, and is available from multiple systems integrators. JACE shall have capability to integrate diverse systems and devices (regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed in real time over a secure network using a standard Web browser.
- C. The work provided in this specification shall be performed by two entities. The FMCS Contractor shall have overall responsibility for the Division work. The Enterprise Developer shall be appointed by the Owner and shall provide all work at the Enterprise Server level. Owner will oversee and provide procurement for Enterprise Developer services. See Section 1.3 for more detail on the division of work.
- D. All materials and equipment used shall be standard components. All systems and components shall have been thoroughly tested and proven in actual use for at least two years.
- E. All wiring shall be done in accordance with all local and national codes.

1.3 DIVISION OF WORK

- A. The FMCS contractor shall be responsible for all communicating thermostats, any miscellaneous controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring specified to be provided in Division 23.
- B. The Division 26 (if applicable) contractors shall be responsible for all controllers Security NAC, control devices (BACnet, LONworks or Modbus), control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring specified to be provided in Division 26. These devices shall be configured and commissioned by Division 26 contractors and later managed in the NAC by FMCS contractor.
- C. The FMCS contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), User Configurable Dashboard software and connection of the NAC to the local or wide area network. FMCS shall also be responsible for development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, and network management for all IDC or IBC devices provided in Division 23 and 26. IDC or IBC devices not provided by FMCS contractor shall be configured and commissioned by appropriate contractor and later managed in the NAC by FMCS contractor.
- D. For reasons of security and consistency, it is the owner's intention to divide the work defined in this section into two sections. Work performed at the NAC level and below shall be performed by a qualified FMCS Systems Integrator. All work provided at the Enterprise Server and between the server and other systems shall be provided by the owner appointed Enterprise Developer. The Enterprise Developer shall be responsible for the "learning" of the WBI (web browser graphics) from the NAC to the Enterprise Server, the configuration of the Periscope Dashboard software and the global integration strategies across NACs and other intelligent building systems. The Enterprise Developer shall also be responsible for all Security integration at the Server level, if applicable.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Products integrated and installed but not furnished under this section
 - 1. Project specific equipment
 - a. JACE-8000 w/ IO-34 and 4.10 software
 - b. Wall Adapter – power supply for J-2..90-240 VAC 50/60 Hz. Wall Adaptor
 - c. Web version of WorkPlace AX
 - d. 8 Universal Inputs – 4 Form A Relay Outputs and 4 0-10 VDC Analog Outputs
 - e. 16 Universal Inputs – 10 Form A Relay Outputs and 8 0-10 VDC Analog
 - f. Veris meter (if applicable)
 - g. Electric pulse meter (if applicable)
 - h. Gas meter (if applicable)
 - i. Water meter (if applicable)

1.5 QUALITY ASSURANCE

- A. The FMCS system shall be designed and installed, commissioned and serviced by factory trained personnel. Systems Integrator shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment.

1. The Systems Integrator shall provide full time, on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the FMCS.
 2. The Bidder shall be regularly engaged in the manufacturing, installation and maintenance of FMCS systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the manufacture, installation and maintenance of FMCS systems similar in size and complexity to this project with a maintained service organization. Provide a list of 10 projects, similar in size and scope to this project, completed within the last five years.
- B. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
- C. All FMCS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under Standard UL 864, categories UUKL, UDTZ, and QVAX and be so listed at the time of bid. All floor level controllers shall comply, at a minimum, with UL Standard UL 916 category PAZX; Standard UL 864, categories UDTZ, and QVAX and be so listed at the time of Bid.
- D. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
- E. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.
- F. This system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability to upgrade existing field panels to current level of technology, and extend new field panels on a previously installed network.
1. Compatibility shall be defined as the ability for any existing field panel microprocessor to be connected and directly communicate with new field panels without bridges, routers or protocol converters.

1.6 SUBMITTALS

- A. Provide individuals experienced with the installation and startup of equipment related to this type of integration.
1. Eight copies of shop drawings of the entire FMCS shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. The FMCS shall submit an architecture layout that depicts devices from the JACE to NAC down to the device level.

2. A complete written Sequence of Operation shall also be included with the submittal package. The FMCS Systems Integrator shall coordinate data from other contractors supplying products and systems, as part of their package and shall provide catalog data sheets, wiring diagrams and point lists to the owner for proper coordination of work.
- B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol. The FMCS Systems Integrator shall be responsible for integrating all network level devices into the overall trunk cable schematic diagrams for the entire Wide Area Network (WAN).
- C. Submittal shall also include a complete point list of all points to be connected FMCS by the Systems Integrator. System integrator shall provide necessary point lists, protocol documentation, and factory support information for systems provided in their respective divisions but integrated into the FMCS.
- D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner. Submittal shall also include a copy of the expected Dashboard viewlets being provided for owner configuration. The owner will provide an example of an acceptable graphic template. Where a particular graphic template does not exist, the Integrator shall create a similar template and gain approval during submittal process.
- E. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Division 23 and 26 contractors shall provide as-builts for their portions of work. The FMCS Systems Integrator shall be responsible for as-builts pertaining to overall FMCS architecture and network diagrams. All as built drawings shall also be installed into the FMCS server in a dedicated directory.

1.7 SPECIFIC NOMENCLATURE

- A. Acronyms used in this specification are as follows:

FMCS	Facility Management and Control System
TCS	Temperature Control System
NAC	Network Area Controller
IDC	Interoperable Digital Lon Controller
FPC	Freely Programmable Lon Controllers
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement

1.8 SOFTWARE LICIENCE AGREEMENT

- A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
- B. It is the owners express goal to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.10 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Systems Integrator's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.11 WARRANTY

- A. Provide all services, materials and equipment necessary for the successful operation of the entire FMCS for a period of one year after beneficial use.
- B. The adjustment, required testing, and repair of the system includes all computer equipment, transmission equipment and all sensors and control devices.
- C. With owner pre-approval, the on-line support services shall allow the local FMCS Systems Integrator to dial out over telephone lines to monitor and control the facility's building automation system. Pending owner approval, this remote connection to the facility shall be within 2 hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after business hours, weekends and holidays.
 - 1. If the problem cannot be resolved on-line by the local office, the national office of the building automation system manufacturer shall have the same capabilities for remote connection to the facility.
 - 2. If the problem cannot be resolved with on-line support services, the FMCS manufacturer shall dispatch the appropriate personnel to the job site to resolve the problem within a reasonable time frame.

1.12 ACCEPTABLE SYSTEM INTEGRATORS

- A. The FMCS Systems Integrator shall provide NAC hardware, software and DDC components. NAC hardware and software shall be the Vykron, Schneider Electric, Distech brand or equal. The successful FMCS Systems Integrator shall not have password access to the Enterprise Server and shall be restricted to NAC access.
- B. The FMCS Systems Integrator shall have a technical support group accessible that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices and other devices as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet, LonWorks technology, MODBUS, existing OPC if applicable, and other existing open and proprietary communication protocols if applicable in one open, interoperable system.
- B. The supplied computer software shall employ component-based technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.
- C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.

2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.3 NETWORKS

- A. The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and OBIX for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.
- B. Local area network minimum physical and media access requirements:
 1. Ethernet; IEEE standard 802.3
 2. Cable; 100 Base-T, UTP-8 wire, category 5
 3. Minimum throughput; 100 Mbps.

2.4 NETWORK ACCESS

- A. Remote Access.

For Local Area Network installations the Owner shall provide a connection to the Internet to enable access via the customer's Intranet to a corporate server. FMCS Systems Integrator shall connect to IP drop provided by the Owner within 25 feet.

2.5 NETWORK AREA CONTROLLER (NAC)

- A. The FMCS Systems Integrator shall supply one or more Network Area Controllers (NAC) as part of this contract to manage devices/points in all specification sections. This division shall be required to integrate BACNet zone information provided by the Division 280000 Systems Integrator into the HVAC and Lighting Sequence of Operation. The number of NACs provided by this Systems Integrator is dependent on the type/quantity of devices and points. It is the responsibility of the FMCS Systems Integrator to coordinate with all Division contractors to determine the quantity and type of NACs needed to fulfill the operating sequences.
- B. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
 1. Calendar functions
 2. Scheduling
 3. Trending
 4. Alarm monitoring and routing
 5. Time synchronization
 6. Integration of LonWorks controller data and BACnet controller data
 7. Network Management functions for all LonWorks based devices
- C. The Network Area Controller must provide the following hardware features as a minimum:
 1. Two Ethernet Ports – 10/100 Mbps

2. One LonWorks Interface Port – 78KB FTT-10A (if applicable)
 3. Two RS-485 ports
 4. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
 5. The NAC must be capable of operation over a temperature range of 32 to 122°F
 6. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
 7. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing
- D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- E. NAC Alarm Notification and actions
1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
 2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
 3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
 - a. To alarm
 - b. Return to normal
 - c. To fault
 4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
 5. Provide timed (schedule) routing of alarms by class, object, group, or node.
 6. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
 7. Control equipment and network failures shall be treated as alarms and annunciated.
 8. Alarms shall be annunciated in any of the following manners as defined by the user:
 - a. Screen message text
 - b. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
 1. Day of week
 2. Time of day
 3. Recipient
 - c. Pagers via paging services that initiate a page on receipt of email message
 - d. Graphic with flashing alarm object(s)
 9. The following shall be recorded by the NAC for each alarm (at a minimum):

- a. Time and date
 - b. Location (building, floor, zone, office number, etc.)
 - c. Equipment (air handler #, accessway, etc.)
 - d. Acknowledge time, date, and user who issued acknowledgement.
 - e. Number of occurrences since last acknowledgement.
10. Alarm actions may be initiated by user defined programmable objects created for that purpose.
 11. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
 12. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.
 13. Provide a “query” feature to allow review of specific alarms by user defined parameters.
 14. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
 15. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

F. NAC Data Collection and Storage

1. The NAC shall have the ability to collect data for any property of any object and store this data for future use. See points list for required logs.
2. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
 - a. Designating the log as interval or deviation.
 - b. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 - c. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 - d. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 - e. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
3. All log data shall be archived to a database in the Enterprise Server and the data shall be accessed from a standard Web browser and the Periscope Dashboard.
4. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
5. All log data shall be available to the user in the following data formats:
 - a. HTML

- b. XML
 - c. Plain Text
 - d. Comma or tab separated values
6. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
7. The NAC shall have the ability to archive its log data remotely to a server on the network. Provide the ability to configure the following archiving properties, at a minimum:
- a. Archive on time of day
 - b. Archive on user-defined number of data stores in the log (buffer size)
 - c. Archive when log has reached its user-defined capacity of data stores
 - d. Provide ability to clear logs once archive.

G. NAC AUDIT LOG

1. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log to a server. For each log entry, provide the following data:
- a. Time and date
 - b. User ID
 - c. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

H. NAC DATABASE BACKUP AND STORAGE

1. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval. Enterprise Developer shall coordinate with Owner to establish/implement a backup procedure.
2. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
3. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.6 WEB BROWSER CLIENTS

- A. The system shall also allow use of an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. The system shall be capable of providing a rich user experience (including full use of the engineering toolset) through the use of java applets or a simple user interface using only HTML, CSS and JavaScript. Refer to Sequence of Operations for the client side display types that are required on this project.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms

of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.

- C. The Web browser shall provide the same view of the graphics, schedules, calendars, logs, etc as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
 - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client (unless clearly stated in the sequence of operation). Any animated graphical objects supported by the GUI shall be supported by the Web browser interface. Enterprise Developer shall provide a FMCS Systems Integrator with a basis of performance/expectation for GUI. FMCS Systems Integrator shall use this standard graphic template or modify the graphics slightly to achieve the desired specification requirement/outcome.
 - 3. Storage of the graphical screens shall be in the Network Area Controller (NAC) and these graphics shall be “learned” by the Enterprise Server.
 - 4. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
 - 5. Owner shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - 1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - 2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - c. View logs and charts
 - d. View and acknowledge alarms
 - e. Setup and execute SQL queries on log and archive information
 - 6. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide each specific user a defined home page based on their usage requirements. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
 - 7. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.7 SYSTEM PROGRAMMING

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.
- B. A library of control, application, and graphic components shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control components from the library, dragging or pasting them on the screen, and linking them together using a built-in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display components to the application components to provide “real-time” data updates. Any real-time data value or component property may be connected to display its current value on a user display. Systems requiring a separate software tool to create applications and browser user interface displays shall not be acceptable.
- C. Programming Methods
 - 1. Provide the capability to copy components from the supplied libraries, or from a user-defined library to the user's application. Components shall be linked by a graphical linking scheme by dragging a link from one component to another. Component links will support one-to-one, many-to-one, or one-to-many relationships. Linked components shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to components on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
 - 2. Configuration of each component will be done through the component's property sheet using fill-in the blank fields, list boxes, and selection buttons. Requiring the use of custom programming, scripting language, or a manufacturer-specific procedural language for every component configuration will not be accepted.
 - 3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
 - 4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database components shall not be allowed.
 - 5. The system shall support component duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.8 COMPONENT LIBRARIES

- A. A standard library of components shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

- B. The components in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group components created in their application and store the new instances of these components in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated components and applications as they are developed.
- D. All control components shall conform to the control component specified in the BACnet specification.
- E. The component library shall include components to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
 - 1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific components to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.
 - 2. For devices not conforming to the LonMark standard, provide a dynamic component that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
 - 3. For BACnet devices, provide the following components at a minimum:
 - a. Analog In
 - b. Analog Out
 - c. Analog Value
 - d. Binary
 - e. Binary In
 - f. Binary Out
 - g. Binary Value
 - h. Multi-State In
 - i. Multi-State Out
 - j. Multi-State Value
 - k. Schedule Export
 - l. Calendar Export
 - m. Trend Export
 - n. Device
 - 4. For each BACnet component, provide the ability to assign the component a BACnet device and component instance number.
 - 5. For BACnet devices, provide the following support at a minimum
 - a. Segmentation
 - b. Segmented Request
 - c. Segmented Response
 - d. Application Services

- e. Read Property
- f. Read Property Multiple
- g. Write Property
- h. Write Property Multiple
- i. Confirmed Event Notification
- j. Unconfirmed Event Notification
- k. Acknowledge Alarm
- l. Get Alarm Summary
- m. Who-has
- n. I-have
- o. Who-is
- p. I-am
- q. Subscribe COV
- r. Confirmed COV notification
- s. Unconfirmed COV notification
- t. Media Types
- u. Ethernet
- v. BACnet IP Annex J
- w. MSTP
- x. BACnet Broadcast Management Device (BBMD) function
- y. Routing

2.9 LONWORKS NETWORK MANAGEMENT

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as “binding”. Systems requiring the use of third party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to “learn” an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.10 BACNet NETWORK MANAGEMENT

- A. The Network Area Controller shall support the integration of device data from BACNet TCP/IP or BACNet MSTP system devices. The connection to the BACNet system shall be via an RS485, or Ethernet IP as required by the device.

- B. Provide the required components in the library, included with the Graphical User Interface programming software, to support the integration of the Bacnet system data into the FMCS. Components provided shall include at a minimum:
 - 1. Read/Write BACNet AI Points
 - 2. Read/Write BACNet AO Points
 - 3. Read/Write BACNet AV Points
 - 4. Read/Write BACNet BI Points
 - 5. Read/Write BACNet BO Points
 - 6. Read/Write BACNet BV Points
- C. All scheduling, alarming, logging and global supervisory control functions, of the BACNet system devices, shall be performed by the Network Area Controller.
- D. The FMCS supplier shall provide a BACNet system communications driver. The equipment system vendor that provided the equipment utilizing BACNet shall provide documentation of the system's interface and shall provide factory support at no charge during system commissioning
- E. BACnet Conformance:
 - 1. Logic controllers shall as a minimum support MS/TP BACnet LAN type. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Logic controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:
 - a. Files Functional Group
 - b. Reinitialize Functional Group
 - c. Device Communications Functional Group
 - 2. Refer to Section 22.2, BACnet Functional Groups, in the BACnet Standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

2.11 COMMUNICATING THERMOSTATS

- A. The manufacturer of the Thermostat hardware and software components must be primarily engaged in the manufacture of BAS as specified herein, and must have been so for a minimum of five (5) years.
- B. The manufacturer shall be ISO 9001:2000 certified. This is to insure that all manufacturing, design and support policies comply with a minimum quality assurance standard. Corporate quality assurance policies should be available for examination upon request by the owner or his agent.
- C. The manufacturer of the hardware and software components shall have a technical support group accessible via a toll free number that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.
- D. Acceptable providers of the Communicating Thermostat hardware and software components as specified herein are as follows. Acceptance as a product provider does not provide approval to be an acceptable FMCS Systems Integrator.

- a. Reliable
- b. ABB
- c. Viconics
- d. Distech Controls
- e. Honeywell
- f. Delta

- E. Communicating Thermostats shall be LON or BACNet thermostats. FMCS Systems Integrator shall standardize on a single protocol for all thermostats and IDC/IBCs (if non thermostat controllers are needed) provided, i.e. all controllers provided shall be of the same protocol. This does not necessarily apply to controllers provided in other sections of the specification as there may be limited choices, but when possible, standardize on a single protocol.

2.12 LON DEVICES (IDC)

- A. The manufacturer of the hardware and software components must be primarily engaged in the manufacture of BAS as specified herein, and must have been so for a minimum of five (5) years.
- B. The manufacturer shall be ISO 9001:2000 certified. This is to insure that all manufacturing, design and support policies comply with a minimum quality assurance standard. Corporate quality assurance policies should be available for examination upon request by the owner or his agent.
- C. The manufacturer of the hardware and software components shall have a technical support group accessible via a toll free number that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.
- D. Acceptable manufacturers of the hardware and software components as specified herein are as follows. Acceptance as a product manufacturer does not provide approval to be an acceptable Systems Integrator.
 - a. Reliable
 - b. ABB
 - c. Viconics
 - d. Distech Controls
 - e. Honeywell
 - f. Delta

2.13 BACNET DEVICES (IBC)

- A. The manufacturer of the hardware and software components must be primarily engaged in the manufacture of BAS as specified herein, and must have been so for a minimum of five (5) years.
- B. The manufacturer shall be ISO 9001:2000 certified. This is to insure that all manufacturing, design and support policies comply with a minimum quality assurance standard. Corporate quality assurance policies should be available for examination upon request by the owner or his agent.

- C. The manufacturer of the hardware and software components shall have a technical support group accessible via a toll free number that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.
- D. Acceptable manufacturers of the hardware and software components as specified herein are as follows. Acceptance as a product manufacturer does not provide approval to be an acceptable Systems Integrator.
 - a. Reliable
 - b. ABB
 - c. Viconics
 - d. Distech Controls
 - e. Honeywell
 - f. Delta

2.14 LON/BACNET CONTROLLER(S) STANDARDS

- A. Where possible provide LON Controllers or BACNet Controllers that can meet the required sequence of operation and can be configured rather than custom programmed. All controllers shall be designed for easy installation and servicing including removable enclosures, removable terminals, and factory applied labels for all I/O. All internal points shall be fully supported by the Graphical User Interface (GUI), allowing the user to easily modify them and monitor them. All of the internal programming points (e.g. variables, constants, PID's, timers, inputs and outputs) shall be exposed to the network on dedicated network variable outputs.
- B. Performance Standards for Inputs - Provide software selectable universal inputs. Analog inputs - shall have the following minimum level of performance: 10 bit A to D resolution; manage thermistors with an accuracy of: $\pm 0.9^{\circ}\text{F}$, and a Potentiometer. For VAV Applications provide a differential pressure input sensor built in to the controller with a adjustable range of .05" to 2" H₂O (125-300PA) static pressure with a minimum accuracy of + or – 3%. Minimum response time shall be 0.5 seconds from input to output time.
- C. Performance Standards for Outputs – Analog outputs shall have the following minimum level of performance: Tri-mode Voltage of 0-10 VDC (linear), digital 0-12 VDC (off/on) or PWM. All analog outputs shall be equipped with an auto-reset fuse. Output Resolution shall be a minimum 8 bits digital / analog converter. Digital outputs shall be provided with a minimum of a triac output rated at 24VAC and 1 amp. All analog outputs and power supply shall be fuse protected
- D. Application Specific Controllers (ASC)- A controller designed through its I/O configuration and configurable control logic to be used for a specific type mechanical equipment. Typical applications are VAV boxes, Fan Coil Units, Roof Top Units, Unit Ventilators, Split DX Systems, Heat Pumps, Lighting Controls, etc. All ASC's shall conform to the LonMark or BACNet standards so long as such a standard exists for its intended application. The ASC shall allow the use of its spare I/O as dumb I/O to be shared over the network to NAC where a sequence of operation can be applied to the I/O. Such applications shall include but not be limited to exhaust fan control, heaters, light control, etc.
- E. Freely Programmable Controllers (FPC) shall be a controller designed for more complex sequences of operations such as built up AHU's, central plant operations, electrical monitoring, and control and management for chillers, boilers and generators. These FPCs are to allow for the flexibility of custom control programming to meet the needed sequences of operation.

2.15 MODBUS SYSTEM INTEGRATION

- A. The Network Area Controller shall support the integration of device data from Modbus RTU, Ascii, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.
- B. Provide the required components in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FMCS. Components provided shall include at a minimum:
 - 1. Read/Write Modbus AI Registers
 - 2. Read/Write Modbus AO Registers
 - 3. Read/Write Modbus BI Registers
 - 4. Read/Write Modbus BO Registers
- C. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.
- D. The FMCS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning
- E. Provide a Modbus Interface to the following equipment:
 - 1. switchgear
 - 2. packaged pumping system
 - 3. building energy metering

2.16 THIRD PARTY INTEGRATION

- A. The Network Area Controller shall support the integration of device data from the existing control system. The connection to the existing system shall be via an RS-232 connection between the Network Area Controller and the existing control system {if applicable on this project}.
- B. Provide the required data points from the third party integration per sequence of operations and/or points list

2.17 SENSORS

- A. All control items, except thermostats, sensors and transmitters located in rooms shall be properly identified with engraved plastic nameplates permanently attached. Nameplates shall have white letters on a black background.
- B. Room thermostat, sensor and transmitter locations shall be coordinated to align vertically or horizontally with adjacent light switches or other control devices. Room thermostats and sensors shall be mounted with the bottom 5'-0" above the floor. Sensors installed in areas where they are subject to physical abuse (ex: gymnasiums) shall be furnished with protective type aspirating guards. Sensors installed on exterior walls shall be installed on non-conductive (cork) sub-base. Sensors shall have plus or minus local control feature.
- C. Temperature Sensors: Thermistor type with an accuracy of plus or minus 0.40 degree F over the entire control range. Sensors for pipe installations shall be immersion type, brass well, and thermistor with integral lead wire. Sensors for duct application shall be insertion probe type,

stainless steel probe, integral handibox, and thermistor with integral lead wire. Space temperature sensors shall be compatible with the unit controller and shall be provided in a decorative metal or plastic enclosure (Nema 4X where exposed to pool environment). Space temperature sensors shall be provided with setpoint and temperature indication only. Outdoor temperature sensors shall be mounted inside a protective weather and sun shield and shall be located on a North wall.

- D. Humidity Sensors: Thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%), 12 - 30 VDC input voltage, analog output (0 - 10 VDC). Operating range shall be 5 to 95% RH and -40 to 170 degree F. Duct mounted type sensors shall have a stainless steel insertion element, sealed to prohibit corrosion. Sensors shall be selected for wall, duct or outdoor type installation as appropriate.
- E. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 50 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC/DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.
- F. Differential Air Pressure Switch: Differential pressure switches for proving fan operation or sense dirty air filters shall be SPDT type, UL approved, and selected for the appropriate operating range of the equipment to which it is applied. Sensor shall have 1/4" compression type fittings and shall have an adjustable setpoint. Furnish with 1/4" barbed type static pressure tips.
- G. Current Switches (Type 1): For proving fan or pump operational status, provide solid or split-core type current status switches with adjustable setpoint and solid-state internal circuitry. Current switch shall have induced power, trip point set adjustment to plus or minus 1% over a range of 1 to 135 amps, trip and power LED, and field adjustable to indicate both On-Off conditions and loss of load (broken belt, etc.). Units shall have a five-year manufacturer's warranty. Current switches shall be Hawkeye Series H-908 by Veris Industries, or approved equal.
- H. Current Switches (Type 2): For proving fan or pump operational status, provide solid or split-core type current switches ("Go/No" type). Current switch shall have induced power, 100 percent solid state with no moving parts. Units shall have a five-year manufacturer's warranty. Current switches shall be Hawkeye series H-900 by Veris Industries, or approved equal.
- I. Low Temperature Sensors: For sensing low temperatures in air handling units, provide SPST type switch, 35 to 45 degree F range, manual reset, vapor charged twenty foot long sensing element, and 120-volt electrical power connection. Low temperature sensor ("freeze-stat") shall be JCI Model A11A-1, or equal.
- J. Pressure Transmitters: For sensing static pressure in a duct system (usually for VAV systems), provide a pressure transmitter with integral capacitance type sensing action, solid state circuitry, accuracy of plus or minus 1% of range, zero and span adjustments, 10 to 35 VDC operating voltage, 4 to 20mA output, and integral inlet port connections. Select pressure range suitable for the application. Differential pressure transmitter shall be Ashcroft CXLdp, or approved equal.
- K. Line Voltage Thermostats: For control of equipment using line voltage on-off thermostats (exhaust fans, unit heaters, etc.) provide 120 volt UL Listed wall mounted thermostats. Thermostat shall have a range of 50 to 90 degree F with minimum 2 degree F differential, snap

acting switch, and dial adjustment for temperature setting. Line Voltage Thermostats shall be Honeywell series T631 series or approved equal.

- L. Firestat: For sensing sudden increases in duct temperature (ex: fire condition), provide 120 volt UL Listed SPST switch with adjustable setpoint that breaks the circuit on a rise in temperature above the setpoint and de-energizes the air handling unit fan.
- M. Aquastat: For sensing temperature of a fluid within a pipe system, provide 120-volt SPST strap-on type aquastat, temperature control range of 100 to 240 degree F (adjustable). Aquastat shall be JCI Model A19DAC-1, or equal.
- N. Air Flow Monitoring Device
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Ebtron Advantage Gold Series for use with GTx116 transmitters or a comparable product by one of the following:
 - a. Tek-Air Systems
 - b. Johnson Controls
 - 2. Provide airflow/temperature measurement devices (ATMD) where indicated on the plans. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.
 - 3. Each ATMD shall consist of one or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor assemblies.
 - a. Each sensor assembly shall contain two individually wired, hermetically sealed bead-in-glass thermistors.
 - b. Thermistors shall be mounted in the sensor assembly using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment.
 - c. The airflow rate of each sensor assembly shall be equally weighted and averaged by the transmitter prior to output.
 - d. The temperature of each sensor assembly shall be velocity weighted and averaged by the transmitter prior to output.
 - e. Each transmitter shall have a 16-character alpha-numeric display capable of displaying airflow, temperature, system status, configuration settings and diagnostics.
 - f. Devices using chip-in-glass or diode-case chip thermistors are not acceptable.
 - g. Devices using less than two thermistors in each sensor assembly are not acceptable.
 - h. Devices using platinum wire RTDs are not acceptable.
 - i. Devices having electronic circuitry mounted in or at the sensor probe are not acceptable.
 - j. Pitot tubes and arrays are not acceptable.
 - k. Vortex shedding devices are not acceptable.
 - 4. All Sensor Probes
 - a. Each sensor assembly shall independently determine the airflow rate and temperature at each measurement point.

- b. Each sensor assembly shall be calibrated at a minimum of 16 airflow rates and 3 temperatures to standards that are traceable to the National Institute of Standards and Technology (NIST).
- c. Airflow accuracy shall be +/-2% of Reading over the entire operating airflow range.
- i. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
- d. Temperature accuracy shall be +/-0.15° F over the entire operating temperature range of -20° F to 160° F.
- e. The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing).
- f. Each sensor probe shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
- g. Each sensor assembly shall not require matching to the transmitter in the field.
- h. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter for each measurement location.

5. Duct and Probes

- a. Probes shall be constructed of extruded, gold anodized, 6063 aluminum tube. All wires within the aluminum tube shall be Kynar coated.
- b. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
 - i. Insertion mounted through the side or top of the duct
 - ii. Internally mounted inside the duct or plenum
 - iii. Standoff mounted inside the plenum
- c. The number of sensor housings provided for each location shall be as follows:

Duct Area (sq.ft.)	Total # Sensors / Location
<2	4
2 to < 4	6
4 to < 8	8
8 to <16	12
>=16	16

- d. The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated on the plans.

6. Fan Inlet Probes

- a. Sensor assemblies shall be mounted on 304 stainless steel housings.
- b. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.

- c. Mounting feet shall be constructed of 304 stainless steel.
- d. The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated on the plans.

7. Transmitters

- a. The transmitter shall have an integral LCD display capable of simultaneously displaying airflow and temperature. The LCD display shall be capable of displaying individual airflow and temperature readings of each independent sensor assembly.
- b. The transmitter shall be capable of field configuration and diagnostics using an on-board pushbutton interface and LCD display.
- c. The transmitter shall have a power switch and operate on 24 VAC (isolation not required).
 - i. The transmitter shall use a switching power supply fused and protected from transients and power surges.
 - ii. The transmitter shall use "watch-dog" circuitry to assure reset after power disruption, transients and brown-outs.
- d. All interconnecting pins, headers and connections on the main circuit board, option cards and cable receptacles shall be gold plated.
- e. The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be installed at a location that is protected from weather and water.
- f. The transmitter shall be capable of communicating with other devices using the following interface option: Linear analog output signals for airflow and temperature: Field selectable, fuse protected and isolated, 0-10VDC/4-20mA (4-wire)

9. The ATMD shall be UL listed as an entire assembly.

10. The ATMD shall carry the CE Mark for European Union shipments.

11. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans.

2.21 DAMPERS AND ACTUATORS

- A. Damper actuators shall be sized by the Systems Integrator for the intended application. Unless noted otherwise, dampers will be furnished by the Systems Integrator for all field installed dampers that are not included as part of the equipment. In general, provide opposed blade type dampers for modulating control and parallel type dampers for two-position control applications. Actuators shall be equal to Honeywell MS or ML series actuators.
- B. Control Dampers: When indicated to be furnished by the Systems Integrator, control dampers shall be equal to Ruskin CD30VG2 or Honeywell D2 or D3 series dampers. Provide all automatic control dampers not specified to be integral with other equipment. Frames shall be 5 inches wide and of no less than 16-gauge galvanized steel. Inter-blade linkage shall be within the frame and out of the air stream. Blades shall not be over 8 inches wide nor less than 16-gauge galvanized steel triple V type for rigidity. Bearings shall be acetal, oilite, nylon or ball-bearing with ½ inch diameter plated steel shafts. Dampers shall be suitable for temperature ranges of -40 to 180F. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types. Dampers shall be sized to meet flow requirements of the application. The sheet metal contractor shall

furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6". Dampers with dimensions of 24 inches and less shall be rated for 3,000 fpm velocity and shall withstand a maximum system pressure of 5.0 in. wc. Dampers with dimensions of 36 inches and less shall be rated for 2,500 fpm velocity and shall withstand a maximum system pressure of 4.0 in. wc. Dampers with dimensions of 48 inches and less shall be rated for 2,000 fpm velocity and shall withstand a maximum system pressure of 2.5 in. wc. Side seals shall be stainless steel of the tight-seal spring type. Dampers shall be minimum leakage type to conserve energy and the temperature control manufacturer shall submit leakage data for all low leakage control dampers with the temperature control submittal. Maximum leakage for low leakage dampers in excess of sixteen inches square shall be 8 CFM per square foot at static pressure of 1 inch of WC. Low leakage damper blade edges shall be fitted with replaceable, snap-on, inflatable seals to limit damper leakage. Testing and ratings shall be in accordance with AMCA Standard 500. Damper blade width shall be no greater than 8 inches, and dampers over 48 inches wide by 74 inches high shall be sectionalized. Testing and ratings to be in accordance with AMCA Standard 500.

- C. Damper Actuators: Damper actuators shall be provided for all automatic dampers. Damper actuators controlled through the DDC system shall be low voltage electronic type, either modulating or two-position, as required to achieve the intended sequence of operation. Provide with spring return when required for fail-safe operation. Modulating dampers shall be positive positioning in response to a 2 - 10 VDC or 4 - 20mA control signal. Actuator shall include the capability of adding auxiliary switches for position indication. Furnish actuators other than spring return type with a release button (clutch) or handle on the actuator to allow for manual override. Power supply to the actuator shall be by 120 VAC, 24 VAC, or 24 VDC and the actuator shall be furnished with a factory installed 3-foot cable with end fitting for field connection. All actuators shall be UL Listed by the manufacturer. Actuators shall be Honeywell MS or ML series actuators.

2.22 VARIABLE FREQUENCY DRIVES.

- A. Variable Frequency drives shall be Honeywell NXS, ABB or equivalent. Variable frequency drives shall be UL listed and sized for the power and loads applied. Drives shall include built-in radio frequency interference (RFI) filters and be constructed to operate in equipment rooms and shall not be susceptible to electromagnetic disturbances typically encountered in such environments. Similarly, the drives must not excessively disturb the environment within which it is used. All VFDs over 3 horsepower shall be provided with an AC choke. VFDs shall be installed in strict conformance to the manufacturer's installation instructions, and shall be rated to operate over a temperature range of 14 to 104 F.
- B. VFD automatic operation shall be provided with a LON, BACNet or Modbus communications card. Each VFD shall be fan cooled and have an integral keypad and alphanumeric display unit for user interface. The display shall indicate VFD status (RUN motor rotation, READY, STOP, ALARM, and FAULT), and shall indicate the VFD current control source (DDC input signal, keypad, or field bus control). In addition to the alphanumeric display, the display unit shall have three pilot lights to annunciate when the power is on (green), when the drive is running (green, blinks when stopping and ramping down), and when the drive was shut down due to a detected fault (red, fault condition presented on the alphanumeric display).
- C. Three types of faults shall be monitored, "FAULT" shall shut the motor down, "FAULT Auto-reset" shall shut the motor down and try to restart it for a programmable number of tries, and "FAULT Trip" shall shut the motor down after a FAULT Auto-reset fails to restart the motor. Coded faults shall be automatically displayed for the following faults:
1. Over current
 2. Over voltage

3. Earth ground
4. Emergency stop
5. System (component failure)
6. Under voltage
7. Phase missing
8. Heat sink under temperature
9. Heat sink over temperature
10. Motor stalled
11. Motor over temperature
12. Motor underload
13. Cooling fan failure
14. Inverter bridge over temperature
15. Analog input control under current
16. Keypad failure
17. Other product unique monitored conditions

- D. In addition to annunciating faults, at the time of fault occurrence the VFD shall capture and make available to the user certain system data for subsequent analysis during fault trouble shooting, including duration of operation (days, hours, minutes, seconds), output frequency, motor current, motor voltage, motor power, motor torque, DC voltage, unit temperature, run status, rotation direction, and any warnings. The last 30 fault occurrences shall be retained as well as the fault data listed in the previous sentence of each fault. New faults beyond 30 shall overwrite the oldest faults.
- E. The display unit keypad shall allow setting operational parameters including minimum and maximum frequency, and acceleration and deceleration times. The display shall offer user monitoring of frequency, unit temperature, motor speed, current, torque, power, voltage, and temperature.

2.23 CONTROL VALVES

- A. Control Valves: (Globe Type) Valves shall be Honeywell or equivalent. Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Two-way water valves shall have equal percentage flow characteristics and three-way valves shall have equal percentage flow characteristics straight through and linear through the bypass. Provide valve position indicator on all valves. Leakage rate shall be no more than 0.05% of Cv.
1. Valves 1/2 inch through 1 1/2 inch shall be screwed pattern except where solder connections are specified for valves 1/2 or 3/4 inches. Three-way valves bypass port shall be of one size reduced Cv to preclude the need for a bypass port balancing valve. Valve and cartridge replacement tool shall be configured for maintenance or replacement without draining the coil to prevent water spill; however, an integral isolation valve on the control valve outlet will also be acceptable. Valves shall close off against 58 psi minimum.
 2. Two inch valves shall be "screwed" configuration and 2-1/2 inch and larger valves shall be "flanged" configuration and ANSI-rated to withstand the pressures and temperatures encountered. Valves shall have stainless-steel stems and spring loaded Teflon packaging with replaceable discs.

- B. Control Valves: (Characterized Ball Valves) Valves shall be Honeywell or equivalent. Control valves 1/2 to 2 inches shall be 2-way or 3-way forged brass screwed pattern as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Two-way water valves shall have equal percentage flow characteristics and three-way valves shall have equal percentage flow characteristics straight through and linear flow through the bypass. Leakage rate shall be ANSI Class IV (no more than 0.01% of Cv). Valves shall be rated for no less than 350 psig at no less than 250 degrees F. Provide a removable handle to operate valves manually during actuator power loss or failure.
- C. Two-way valves shall closeoff against 100 psi minimum, and three-way valves shall closeoff against 40 psi minimum. Valves shall have stainless-steel or chemically nickel-plated brass stem and throttling port. Valves shall be tagged with Cv rating and model number.
- D. Butterfly Control Valves: Valves shall be Honeywell or equivalent. Where specified butterfly control valves over 2" in size shall be cast iron body type for 2-way or 3-way applications specified constructed for tight shutoff and shall operate satisfactory against system pressures and differentials. Valves shall have tapped lugs for standard flange connection, and designed for isolation and removal of downstream piping at full rated pressure. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Valves shall be rated for bubble tight shutoff at no less than 150 psi. Valve disc shall be aluminum bronze. Valve stems shall be stainless steel, with inboard top and bottom bronze bearings, and an external corrosion resistant top bearing to absorb actuator side thrust.

2.24 ELECTRICAL MISCELLANEOUS

- A. Panels: All enclosures for DDC controllers and devices shall be fabricated in accordance with UL Standards from code gauge steel. Enclosures shall be provided with a continuous hinge on the door and a flush latching mechanism. Enclosures shall be shop painted with standard grade enamel coating. Back panels shall be furnished when required to facilitate installation of boards or accessories. All enclosures installed outdoors shall be constructed to NEMA 3R standards. All controllers shall be installed within an approved enclosure unless the controller will be installed within the control cabinet section of the equipment that it is intended to control. Enclosures shall facilitate the mounting of gauges, switches, pilot lights, and the like, on the face panel when required. Control devices that are mounted on the face of the panel shall be identified with engraved nameplates. Panels shall be Hoffman A1 series, or approved equal.
- B. Power Transformers: Step-down power transformers shall be provided for all DDC controllers and associated accessory devices as required. Transformers shall be sized and selected to accommodate all connected accessory items. Transformers shall be UL Listed Class 2 type with 120 VAC primary, 24 VAC secondary. Transformers shall be Functional Devices TR series, or approved equal.
- C. Relays: Miscellaneous control relays shall be provided as required to energize or control equipment and devices within the control system. Relays shall be located as close as practical to the controlled device (motor, motor starter, etc.). Where approved by NEC, relays may be installed within starters and equipment control panels where space is available. Relays installed outside of the controlled device shall be provided with a NEMA enclosure suitable for the location where installed. Relays shall be Functional Devices RIB series, or approved equal.

2.25 ELECTRICAL WIRING

- A. Wiring: All wiring devices and accessories shall comply with the requirements of Division 26 and the NEC. All wiring shall be installed in a neat and professional manner. Control wiring shall not be installed in power circuit conduits or raceways unless specifically approved for that purpose. All wiring, except plenum wiring (where allowed), shall be run in electrical conduits. Plenum cable will be allowed in concealed locations where accessible. All cable must be installed with 90° angles and strapped according to the NEC.
- B. Provide all interlock and control wiring. Provide wiring as required by functions as specified and as recommended by equipment and device manufacturers to achieve the specified control functions.
- C. Low voltage conductors shall be stranded bare or tinned-copper with premium grade polymer alloy insulation. For shielded cable, furnish multi-conductor of overall polyester supported aluminum foil with stranded tinned copper drain wire to facilitate grounding. Coaxial shield shall be copper braided type. Provide shielded cable where recommended by the equipment or device manufacturer, grounded in strict accordance with the manufacturer's recommendations.
- D. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Terminations for Fire Alarm Control Panel (FACP) interface shall be accomplished by the Electrical Contractor or his designated subcontractor.
- E. FMCS Systems Integrator shall provide power for all control devices and components from the closest available power source or as indicated on the power Drawings. When acceptable to the equipment manufacturer, low voltage power may be obtained from the internal equipment power source or transformer. Electrical Power for Systems Integrator's use has been provided at j-boxes located on plans.
- F. Magnetic starters shall be furnished and installed by the Electrical Contractor.
- G. Disconnects shall be furnished and installed by the Electrical Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All work described in this section shall be performed by system integrators or contractors that have a successful history in the design and installation of integrated control systems. The installing office shall have a minimum of five years of integration experience and shall provide documentation in the submittal package verifying the company's experience.
- B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- C. Drawings of FMCS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.
- D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the FMCS Systems Integrator in accordance with the specifications in Divisions 23 and 26.

3.2 WIRING

- A. All electrical control wiring and power wiring to the NAC, computers and network components shall be the responsibility of the FMCS contractor.
- B. All wiring shall be in accordance with the the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit unless otherwise allowed by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the FMCS contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

- A. Pending owner pre-approval, the Owner shall grant to the FMCS contractor, reasonable access to the FMCS during the warranty period. The owner shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 SOFTWARE LICENSE

- A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). The owner requires that all Niagara Ax based software and hardware on this project have the following Niagara Information Compatibility Statement (NICS):

- 1. Station Compatibility In = *
- 2. Station Compatibility Out = *
- 3. Tool Compatibility In = *
- 4. Tool Compatibility Out = *

Organizations without the above NICS shall not be allowed to bid.

- B. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara Ax based controllers and/or servers and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the owner.

3.6 ACCEPTANCE TESTING

- A. Upon completion of the installation, the FMCS contractor shall load all system software and start-up the system. The FMCS contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning

in full accordance with these specifications. The FMCS contractor shall coordinate the checkout of the system such that other appropriate Divisions have a representative present during system checkout.

- B. The FMCS contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
- D. System Acceptance: Satisfactory completion is when the Division 230900 contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.7 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the FMCS hardware and software has been established, the contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The FMCS contractor shall provide 12 hours of instruction to the owner's designated personnel on the operation of the FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the FMCS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.
- C. The training shall be in three sessions as follows:
 - 1. Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
 - 2. Warranty Follow Up: Two days (4 hours total) to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

END OF SECTION 230900

SECTION 232923 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 Description

- A. This section describes variable-frequency AC drives (VFDs).

1.2 Related Work Specified Elsewhere

- A. Section 230500, Common Work Results for HVAC
- B. Section 230900, Instrumentation and Controls for HVAC
- C. Division 26, Electrical

1.3 References

- A. IEEE: Institute of Electrical and Electronics Engineers
 - 1. IEEE 519: Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- B. NEC: National Electrical Code
- C. NEMA: National Electrical Manufacturers Association

1.4 Submittals

- A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.
 - 1. Product Data: Include dimensions, weight, schematic and single-line diagram, total harmonic distortion (THD), standard functions, features, capacities, and details of construction.

1.5 Warranty

- A. VFDs shall have a minimum warranty of 12 months from the date of certified startup and not less than 18 months from date of manufacture. The warranty shall include all parts, labor, travel time, and expenses.
- B. The Contractor shall coordinate with the VFD manufacturer and be responsible for the VFD warranty and all VFD problems incurred during and after installation at the work site, as well as provide and warranty any individual VFD units sent to the manufacturer for required equipment run testing. Supply technical assistance during testing at the manufacturer's factory, coordinate shipping, and pay for all costs.

PART 2 - PRODUCT

2.1 Variable-Frequency Motor Controllers

A. Acceptable Manufacturers: ABB, Danfoss or Trane

B. General Description:

1. AC motor variable frequency controller (VFC) shall be of pulse width modulated (PWM) inverter type. The VFC shall be designed to convert 60 Hz input power to adjustable frequency output power to provide positive speed control to standard induction motors. The VFC shall be dedicated variable torque design for specific use with centrifugal loads.
2. Provide complete solid state variable frequency power and logic unit.
3. Frequency control shall be stepless throughout the range under variable torque load on a continuous basis. Frequency controlled by remote building energy management system providing 4-20MA input signal to drive and remote start/stop signal. Coordinate with other work of Division 23.
4. Provide adjustable frequency control with diode bridge/capacity input designed to provide high, constant power factor of 0.95 regardless of load or speed and eliminate SCR line noise.
5. Each VFD shall contribute no more than 5 percent total harmonic voltage distortion at the VFD input terminals while operating under full-load conditions. If proposed VFD equipment is anticipated to exceed these limits, multi-pulse converters and/or harmonic filtering devices shall be provided.
6. Design and manufacture equipment in accordance with applicable NEMA and IEEE recommendations and be designed for installation in accordance with NEC. Equipment shall have UL and/or CSA approval.
7. Control shall be suitable for operation in ambient temperatures of 0 to 40°C.
8. Every VFD shall be factory tested with an AC induction motor 100 percent loaded and temperature cycled within an environmental chamber at 104°F.

C. Self-Protection and Reliability Features:

1. Adjustable current limit from 60 to 110 percent of drive rating.
2. Adjustable instantaneous over current trip.
3. Under voltage trip.
4. Over temperature trip.
5. Short circuit protection phase to phase and phase to ground faults phase rotation insensitive.
6. Momentary power loss, more than 17 milliseconds.
7. Transient protection against all normal transients and surges in incoming power line.
8. Orderly shutdown in event of any of above conditions, drive shall be designed to shut down safely without component failure.
9. Provide visual indication and manual reset.

D. Standard Features:

1. Drive logic shall be microprocessor based. Control logic shall be isolated from power circuitry.
2. Standalone operation to facilitate startup and troubleshooting procedures.
3. VFD shall have a lockable circuit breaker disconnect and be UL 508C listed for use on distribution systems with 22,000 AIC.
4. Door interlock protection which shall be defeatable by qualified personnel to troubleshoot during operation as required.
5. Input power shall be equal to applied input voltage.
6. Isolated signal inputs.
7. Frequency Stability: Output frequency shall be held to +0.1 percent of maximum frequency regardless of load, +10 percent input voltage change or temperature changes within ambient specification.
8. Built-in digital display located in panel face shall indicate output frequency, voltage and current and shall provide indication of over current, over voltage, current limit, ground fault, over temperature, input power on, minimum or maximum speed adjustment, power on, and fault condition.
9. Start/Stop Control: Controlled decelerated stop.
10. Primary and secondary fused for a control circuit transformer.
11. Minimum and maximum speed control.
12. Adjustable Accel/Decel: Independently adjustable 10-100 second.
13. Hands-off auto switches.
14. Programmable auto restart after power outage.
15. Fused disconnects shall include auxiliary contacts to isolate control circuit when disconnect is in "off" position.
16. Remote contacts for fault, and on/off status.
17. Adjustable motor output voltage.
18. Analog output voltage of 0-10 VDC, 4-20MA proportional to control output frequency.
19. Communications port, and programming software capability for BACnet-IP

E. Additional Features:

1. NEMA 1 enclosure shall isolate each motor starter and control section with its associated disconnect switch.
2. Manual speed control for each motor.

3. Manual bypass shall provide ability to service control while motor is operational.
4. Provide radio frequency and electromagnetic interference noise suppression network to limit radio frequency and electromagnetic interference.
5. Provide isolated analog output signals for volts, amps, and frequency, from each VFD for connection to the building energy management system.
6. Provide line (input) reactors.
7. Provide output filters for all VFD's located more than 150 conductor feet from the motor they serve.
8. VFD shall be designed to catch a spinning load in forward and reverse direction.
9. Perform harmonic calculations on a manufacturer-supplied harmonic analysis program for conformance with IEEE 519.

F. CSA, ETL, or UL label.

PART 3 - EXECUTION

3.1 General

- A. Coordinate with the VFD manufacturer to provide and be responsible for all coordination, application engineering, and startup support to ensure that the VFD is properly selected for each piece of equipment.

3.2 Variable Speed Controller Installation

- A. Mount on walls in accordance with the manufacturer's instructions.
- B. Coordinate input/output power connections with Division 26.
- C. Coordinate control signal with other work of Division 23.
- D. Provide startup service by factory authorized technician.

3.3 Testing

- A. Check out, start up, and test systems, equipment, and components specified herein.
- B. The owner reserves the right to witness any or all of the aforementioned tests. Provide notice at least 24 hours before testing.
- C. Provide, at no additional cost to the owner, any technical assistance or support to ensure the proper testing/performance of the VFD and of the system as a whole. This includes programming of the VFD to coordinate with the manufacturer's operating requirements. Allow 2 hours of startup time per VFD.
- D. Provide complete programming information for startup for each VFD. Provide these parameters in writing to the owner prior to the startup of the VFD and cover the protection, ramp up, ramp down, carrier frequency, and all other necessary parameters.

END OF SECTION 232923

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233100 - DUCTWORK

PART 1 - GENERAL

- 1.1 This Section includes ductwork, splitter dampers, balancing dampers, air deflection devices, etc. required for a complete system.
- 1.2 The Drawings are intended to indicate, with reasonable accuracy, the location of components and the general arrangement of the system. All offsets, bends fittings and other devices, not shown but required for the full operation of the system, shall be provided.
- 1.3 Refer to specification Section 230700 for duct insulation

PART 2 - PRODUCT

- 2.1 Low and Medium Pressure Ductwork.
 - A. Round and rectangular ductwork shall be of gauges and construction methods as indicated in the latest ASHRAE Guide and SMACNA Standard.
 - B. Splitter dampers, balancing dampers, turning vanes and air deflection devices shall be installed as shown on the plans and/or where required for the proper control of airflow.
 - C. All take-offs to diffusers shall be tapered type taps with factory damper and locking quadrant.
 - D. All take-offs to VAV Units shall be made with conical taps.
- 2.2 Flexible Ductwork
 - A. Ducts shall be insulated type with foil wrapper complying with NFPA Standard No. 90A and UL181.
 - B. All flexible ducts shall have a factory installed R8 fiberglass insulation with a seamless vinyl vapor barrier.
 - C. Length of flexible duct shall not exceed 14 feet.
 - D. Flexible duct shall be secured and sealed in place with mastic to hard duct collars at each end, with nylon tie-wraps on the wire enforced inner mylar skin, followed by the insulation layer and then the exterior vapor layer secured with another tie-wrap.
- 2.3 Exposed Ductwork
 - A. Exposed shall be round, 18 gauge spiral lock seam with paintable finish, double wall and internally insulated at the factory. Inner wall shall be perforated.
 - B. Duct shall be fastened using sheet metal screws only and no duct tape.

PART 3 - EXECUTION

- 3.1 Turning vanes shall be installed in square elbows for all ductwork.
- 3.2 Duct transitions, splitter dampers, and balancing dampers shall be constructed of gauges and materials as indicated in ASHRAE Guide and SMACNA Standards.

- 3.3 Hangers and supports for ductwork shall be of metal bands, angles and rods as indicated in ASHRAE Guide and SMACNA Standards. The minimum bandwidth shall be 1", 16 gauge, galvanized steel.
- 3.4 Where ductwork passes through floors and walls, the space around the ducts shall be sealed in an approved manner with mineral wool insulation, and/or proper fire seal material approved by the State or Local Inspector.
- 3.5 In exposed areas and mechanical rooms, ductwork openings shall be finished with a metal collar.
- 3.6 Ductwork shall be cross-braced and reinforced properly with galvanized steel angles as recommended by SMACNA Standards.
- 3.7 Where ductwork behind grilles or diffusers is visible, it shall be painted with two coats of flat black base fire retardant paint.
- 3.8 Duct connections to outside air louvers shall be pitched to drain outside and shall be soldered watertight.
- 3.9 Tape all low-pressure joints with Hardcast or approved equal for completely airtight system.
- 3.10 All medium pressure joints are to be sealed in accordance with SMACNA standards for ductwork 2" W.C. and greater. All ducts shall be air tight, rigid and free from vibration and noise.
- 3.11 Duct dimensions shown on the drawings are net inside dimensions.
- 3.12 Where ductwork is lined, as noted in Section 230700, the duct insulation thickness shall be added to the listed ductwork dimensions for final duct size.

END OF SECTION 233100

SECTION 233313 - FIRE DAMPERS

PART 1 - GENERAL

- 1.1 Fire dampers shall be installed where shown on the plans and as required by the latest edition of NFPA 90A.
- 1.2 All fire dampers shall be UL labeled.
- 1.3 Fire dampers shall be in compliance with UL 555 and UL 555S for dynamic dampers.

PART 2 - PRODUCT

- 2.1 Fire dampers shall be of the type and rating as noted on the drawings or as required.
- 2.2 Fire dampers shall be Air Balance, Inc.; Ruskin; Metal Industries; or approved equivalent.

PART 3 - EXECUTION

- 3.1 Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials, and practices required to provide installation equivalent to the manufacturers UL tested assembly.
- 3.2 Fire dampers shall be installed in accordance with the manufacturer's instructions.
- 3.3 Access doors shall be provided for access to each damper assembly.
- 3.4 Doors shall be constructed with a minimum of 24 gauge double wall galvanized steel, insulated with 1" of insulation. Doors shall be UL listed.
- 3.5 Door size shall be 12" x 10" minimum, but as large as possible for access to fusible link.
- 3.6 Two fire dampers shall be installed in fire wall rated for 3 hours or more. Each fire damper shall have a rating equal to the fire wall.
- 3.7 Fire dampers shall be tested by the test and balance sub-contractor and mechanical contractor with witness by engineer of record.

END OF SECTION 233313

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233400 - FANS

PART 1 - GENERAL

- 1.1 Provide all fans, roof caps, etc., of the type and capacities indicated on the Drawings.
- 1.2 Fans, roof caps, curbs, etc., shall be by the same manufacturer.
- 1.3 Fans shall be by Greenheck, Loren Cook, Carnes, Penn, American Air Cool, or equal.

PART 2 - PRODUCT

- 2.1 All fans, roof caps, etc., shall be as scheduled on the Drawings.
- 2.2 All fans shall be equipped with 1/2" mesh birdscreen, gravity damper.
- 2.3 All fan motors shall have vibration isolators, motor housing shall be grounded, and motor overload protection shall be provided.
- 2.4 All curbs shall be of the pre-fab insulated type.
- 2.5 Provide NEMA 3R rated disconnect switch.

PART 3 - EXECUTION

- 3.1 Fans and roof caps shall be installed as shown on the plans.
- 3.2 Roof openings and locations are to be coordinated with the other trades.
- 3.3 Fan motors and all other electric components shall bear the UL or other acceptable third party testing agency label.

END OF SECTION 233400

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

- 1.1 The contractor shall provide air terminal units where shown on the plans.
- 1.2 Units shall be selected as scheduled on the plans.
- 1.3 Units shall be by Price, Nailor, Carrier, Krueger, Trane, Metalaire, Reddi, or Titus.
- 1.4 Air terminal units shall be tested and certified in accordance with ARI Standard 880.

PART 2 - PRODUCT

2.1 VAV Terminal Unit

- A. The unit casing shall be of 24-gauge zinc coated steel, acoustically lined with $\frac{3}{4}$ " thick, 1-1/2 pound density fiberglass and shall comply with UL 181 and NFPA 90A.
- B. The reversible actuator shall be shaft mounted without linkage and shall be an integral part of the electronic controller.
- C. Units shall have pressure independent electronic control and shall be reset for air flow between zero and the maximum cataloged cfm.
- D. The damper shall be double thickness of 24-gauge steel, with shaft rotating in self-lubricating bearing.
- E. Dampers shall be designed such as to prevent air leakage in excess of 1% of the rated quantity at rated inlet static pressure.

2.2 Fan Terminal Unit

- A. The unit casing shall be of 20-gauge zinc coated steel, acoustically lined with 1" thick, 1 ½ pound density fiberglass and shall comply with UL 181 and NFPA 90A.
- B. Unit fans shall be forward curve centrifugal type with direct drive, three speed, permanently lubricated split capacitor type motors.
- C. Unit shall have factory-installed volume control dampers. Dampers shall be designed such as to prevent air leakage in excess of 1% of the rated air quantity at rated inlet static pressure.
- D. Terminal unit fan shall be controlled by means of an electronic speed controller with voltage limiting circuit and shall turn on whenever heating is required even though primary air system is turned off.
- E. Provide with 1" filter rack on the fan air inlet.

2.3 Electric Heat

- A. Fan controls to be provided with a fan interlock relay.
- B. Provide with an air static switch to prove airflow.

PART 3 - EXECUTION

- 3.1 The units shall be installed where shown on the plans.
- 3.2 All units shall be installed according to manufacturer's recommendations.
- 3.3 Suspend units from spring and rubber vibration isolation hangers.
- 3.4 Provide flexible connections at ductwork and piping.
- 3.5 All electrical components shall be UL recognized and installed in accordance with the NEC.
- 3.6 Refer to drawings for controls.
- 3.7 Actuators shall be supplied by controls contractor and mounted at the factory.
- 3.8 Label ceiling grid or access door where installed above ceiling.

END OF SECTION 233600

SECTION 233700 - AIR DISTRIBUTION

PART 1 - GENERAL

- 1.1 Furnish and install air distribution devices of the type, size and configuration indicated on the drawings.
- 1.2 Refer to Architectural Reflected Ceiling Plan and Schedule for types of ceiling specified, and provide compatible frames on air distributions devices.

PART 2 - PRODUCT

2.1 Diffusers, Grilles, and Registers

- A. Surface mounted devices shall have sponge gaskets.
- B. Devices shall be of steel construction with baked on enamel finish, unless otherwise noted.
- C. All devices shall be by Krueger, Carnes, Titus, Metalaire, Tuttle & Bailey, Price or approved equivalent.
- D. Ceiling mounted diffusers shall have insulation applied to metal top and neck to prevent sweating. Insulation shall match duct insulation.
- E. Soffit grilles shall be extruded anodized aluminum with ¼" x ¼" insect screen.
- F. Return and exhaust grilles in lay-in ceilings shall have full louvered face (24" x 24").
- G. Devices in moist and humid spaces shall be of aluminum construction.
- H. Provide heavy-duty steel return grilles (in gymnasiums, multi-purpose rooms, etc) or in all locations where the grille is within 8' off the floor.
- I. Lay-in diffusers installed 12 feet above finished floor shall have adjustable vanes for vertical throw.
- J. Where grilles are installed above hard ceilings with no access to balancing dampers, opposed blade dampers or cable operated dampers shall be installed. Grille/Diffusers to have means of balancing airflow.

2.2 Louvers

- A. Louvers shall be 12 gauge extruded aluminum with drainable blades, unless otherwise noted.
- B. Louvers shall be provided with ½" x ½" insect screen.
- C. Louvers shall be Arrow, Ruskin, Air Balance or approved equivalent.
- D. Provide louvers with required mounting sleeves/support. Coordinate opening with general contractor.
- E. Combination louver/dampers indicated on drawings to have motorized damper shall be interconnected with fans indicated, and shall open when the fan is energized. This Contractor shall provide and make all interconnecting control wiring from the fan to the damper.

PART 3 - EXECUTION

- 3.1 Air distribution devices shall be mounted level, straight, and flush with walls or ceilings.
- 3.2 Color shall be as indicated on drawings, or as selected by the Architect/Engineer.
- 3.3 Locations of all air distribution devices shall be coordinated with ceiling and lighting work.
- 3.4 Provide submittals data to include, cfm, pressure drop, dimensional, velocity and noise criteria data.

END OF SECTION 233700

SECTION 238113 - PACKAGED AIR HANDLING UNIT

PART 1 - GENERAL

- 1.1 Furnish and install where shown on the plan, a one-piece/cooling unit with capabilities as shown on the plans.
- 1.2 The unit shall be completely factory assembled, pre-charged, pre-wired, tested and ready to operate.
- 1.3 Unit shall be U.L. labeled.
- 1.4 Unit shall be Trane or approved equivalent by Carrier or York.

PART 2 - PRODUCT

- 2.1 Cabinet shall be single, enclosed, and weatherproof casing or galvanized steel bonderized and finished with baked enamel. Entire cooling section shall be fully insulated with fire retardant insulation to prevent sweating. A base pan drain connection shall be provided. Panels shall be easily removable for service access.
- 2.2 Compressor system shall consist of serviceable hermetic compressor. Compressor shall have service shut-off valves; suction pressure operated capacity control unloader, suitable vibration isolators and crankcase heater.
- 2.3 Condenser and evaporator coils shall have aluminum plate fins mechanically bonded to copper tubes.
- 2.4 Indoor air fans shall be forward curved, centrifugal type, belt driven. Outdoor fans shall be propeller type, direct driven. All motors shall have overload protection and suitable vibration isolators.
- 2.5 Cooling system shall be protected by fusible plug, high and low pressurestat, compressor motor overloads, anti-cycling timer device (5 minutes). Controls shall include low voltage control circuit transformer, compressor and fan motor safety controls with automatic reset, high and low pressure cutout switches and terminals for accessory electrical connections.
- 2.6 Gas heater assembly shall include 18-gauge aluminized steel heat exchanger, intermittent ignition, safety lockout, redundant gas valve, pressure switch, and mechanical combustion system.
- 2.7 Accessories shall be as indicated on the drawings.

PART 3 - EXECUTION

- 3.1 Units shall be located as shown on the plans.
- 3.2 Units shall be installed and connected in strict accordance with the manufacturer's installation instructions.
- 3.3 Controls shall be as indicated on the plans.
- 3.4 The product manufacturer shall warrant his equipment for a period of one year to be free from defects in material and workmanship. Any part of the equipment that is found to be defective

within the one year period shall be repaired and/or replaced by a well qualified factory designated repair station at no cost to the Owner.

- 3.5 The product manufacturer shall warrant the sealed refrigeration circuit for a period of five years. The sealed refrigeration circuit shall consist of the hermetic compressor assembly, evaporator coil, condenser coil, thermostatic expansion valve, and interconnecting tubing. All repairs under this warranty shall be made by a factory designated repair station at no cost to the Owner.
- 3.6 The warranty periods shall start from the day that the job is accepted by the Owner.

END OF SECTION 238113

SECTION 238143 - SPLIT SYSTEM HEAT PUMP

PART 1 - GENERAL

- 1.1 Furnish and install a direct expansion heat pump indoor unit with capacity as indicated on the plans.
- 1.2 Unit shall be completely factory assembled and pretested.
- 1.3 Unit shall be Trane, Lennox, Mitsubishi, or approved equivalent.

PART 2 - PRODUCT

- 2.1 Air Handling Unit/Fan Coil
 - A. Casing shall be Galvanneal steel, bonderized with baked enamel finish.
 - B. Fan section shall have forward curved blades, centrifugal type, belt or direct drive. Fan shall be statically and dynamically balanced and shall run on permanently lubricated bearings.
 - C. Cooling coils shall be of non-ferrous construction with mechanically bonded aluminum plate fins on copper tube.
 - D. Casing shall be insulated with fire retardant insulation in accordance with NFPA 90A. Insulation shall be secured to casing panels with waterproof cement and permanent fasteners.
 - E. A condensate drain pan shall be furnished with threaded pipe connections and shall extend completely under the coil section. Condensate drain lines shall be insulated copper.
 - F. Electric heater assembly shall include circuit breakers, automatic re-setting limit switches and heat limiter for primary and secondary over-current and thermal protection.
 - G. Accessories shall be as indicated on the drawings.
- 2.2 Outdoor Unit
 - A. Cabinet shall be single, enclosed, and weatherproof casing or galvanized steel bonderized and finished with baked enamel. A base pan drain connection shall be provided. Panels shall be easily removable for service access.
 - B. Compressor system shall consist of serviceable hermetic compressor. Compressor shall have service shut-off valves; suction pressure operated capacity control unloader, suitable vibration isolators and crankcase heater.
 - C. Condenser and evaporator coils shall have aluminum plate fins mechanically bonded to copper tubes.
 - D. Outdoor fans shall be propeller type, direct driven. All motors shall have overload protection and suitable vibration isolators.
 - E. Cooling system shall be protected by fusible plug, high and low pressurestat, compressor motor overloads, anti-cycling timer device (5 minutes). Controls shall include low voltage control circuit transformer, compressor and fan motor safety controls with automatic reset, high and low pressure cutout switches and terminals for accessory electrical connections.

PART 3 - EXECUTION

- 3.1 Unit shall be installed as shown on the plans, in strict accordance with manufacturer's recommendations.
- 3.2 Controls shall be as indicated on the plans.
- 3.3 Provide 5-year compressor warranty.
- 3.4 Provide with spare belts for any belt driven fans.
- 3.5 Provide with (2) sets of filters. Contractor to install one set at system start-up and a second set at completion of project.

END OF SECTION 238143

SECTION 238239 - ELECTRIC RESISTANCE HEATING UNIT

PART 1 - GENERAL

- 1.1 Heating units shall be installed where indicated on the drawings.
- 1.2 All heating units shall be by the same manufacturer.
- 1.3 Heating units shall be Q-Mark, Markel, or approved equivalent.

PART 2 - PRODUCT

- 2.1 Heating units shall be shall UL listed.
- 2.2 Heating units shall be provided with baked-on enamel finish.
- 2.3 Heating element to be heavy-duty steel finish brazed to steel sheathed turbulence elements.

PART 3 - EXECUTION

- 3.1 Unit(s) shall be installed as shown on the drawings.
- 3.2 Unit(s) shall be provided with accessories noted on the drawings.

END OF SECTION 238239

THIS PAGE IS INTENTIONALLY LEFT BLANK

This page intentionally left blank

SECTION 26 00 00 - GENERAL PROVISIONS (ELECTRICAL) CONTRACT

A. GENERAL

1. Scope of Work

- a. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

2. Quality Assurance

- a. See the General and Supplementary General Conditions.
- b. All work shall be in accordance with the North Carolina State Building Code, which includes the 2020 edition of the National Electrical Code.
- c. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- d. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- e. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Article 8 of the General Conditions will be followed for substitutions after award of Contract.

3. Submittals

- a. See General and Supplementary General Conditions and Division 1.
- b. Within ten (10) days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval.
- c. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.
- d. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.

- e. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data, and sufficient manufacturer's literature to operate and maintain all equipment.
 - f. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.
- 4. Product Delivery, Storage and Handling
 - a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
 - b. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.
 - c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.
- 5. Work conditions and Coordination
 - a. The Contractor shall review the mechanical plans to establish points of connection and the extent of electrical work to be provided in his Contract.
 - b. This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract. Unless otherwise noted, this Contractor shall wire to disconnect switches, junction boxes, or circuit breakers as provided in his Contract.
 - c. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/Engineer and shall be at the Contractor's expense with no extra cost to the owner.
- 6. Guarantee
 - a. See the General and Supplementary General Conditions.
 - b. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.

B. PRODUCT

- 1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, transformers, etc. See specification section 26 05 53 Electrical Identification.
- 3. All materials and equipment shall be approved third party agencies or bear re-examination listing where such approval has been established for the type of device in question. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment

C. EXECUTION

1. Inspection

- a. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.
- b. It is the responsibility of the electrical contractor to notify the **Franklin County Electrical Inspector** to schedule required inspections including rough-in, above ceiling and final inspections.

2. Installation

- a. All work shall be performed in a manner indicating proficiency in the trade.
- b. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All patching shall be done in such a manner as to restore the areas or surfaces as to match existing finishes.
- e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.
- f. Grounding
 - 1) All grounding shall be in accordance with the requirements of the NEC. The main secondary service ground from transformer service entrance shall be bare copper wire in conduit clamped to building structural steel. Bond ground wire to conduit at each end. Bond system neutral bus to equipment grounding bus. In addition, cad weld to 10'x 3/4" diameter copper clad steel driven ground rod and clamp to metal cold water main. See the Electrical Riser Diagram.
 - 2) Install a separate green grounding conductor with the circuit conductors in each conduit. Use of the conduit only shall not be an acceptable means of equipment grounding.
 - 3) Install ground wire in all flexible connections (flex shall not be acceptable for grounding purposes), and in all Wiremold.

- 4) All grounding conductors shall be sized per Article 250.122 of the NEC.
 - 5) The ground system shall be tested with a ground resistance and soil resistivity tester and the test report submitted to the Engineer. If resistance exceeds 25 ohms provide an additional driven ground rods separated by a minimum of 6' interconnected with #3/0 copper. A copy of the test report shall be submitted to the engineer to be included in the project closeout document.
 - 6) All ground points shall be accessible for inspection.
 - 7) Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250.122 and lugged to the box.
- g. Electrical Identification. See section 26 05 53
3. Performance
- a. The Contractor shall perform all excavation, backfilling, and patching operations as indicated on the drawings.
4. Erection
- a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.
5. Field Quality Control
- a. The Contractor shall conform to the requirements of Division 3 for concrete testing.
 - b. The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the particular section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the Engineer of his readiness for such test. Final inspections by all authorities having jurisdiction pertaining to division 26 work are required, prior to authorization of final payment.
 - c. Testing required for compliance with the Contract shall be stated in subsequent sections. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. 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.
 - d. The electrical contractor shall obtain a third party commissioning agent to complete the procedures and documentation set forth in ANSI/NETA ECS – 2015 Standard for Electrical Commissioning Specifications for the systems applicable to this project in addition to the requirements in specification section 26 08 00. Where discrepancies exist between the documents, the more stringent of the two requirements shall be met.
 - e. Documentation
 - 1) All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.

- 2) 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.

6. Adjust and Clean

- a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
- c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).

END OF SECTION 26 00 00

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 05 20 - WIRES AND CABLES

A. GENERAL

1. All conductors shall be properly marked showing manufacturer's name, insulation type, voltage rating and wire size. All insulation is to be rated for minimum of 600 volts.
2. Wire sizes shall be as shown. No wire smaller than No. 12 AWG shall be used. The maximum conductor size shall be 600 KCMIL.
3. Where the conductor length from the panel to the first outlet on a 120 volt exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall be increased by at least one size. Provide associated drawing modifications as needed for compliance with NEC Art 250.122(B) proportional increase in equipment ground conductor wherever ungrounded conductor sizes are increased for voltage drop.
4. Conductors shall be manufactured by US Wire and Cable, Triangle, Okonite, Southwire, Encore Wire, or approved equivalents.
5. Wiring for 120/208 volt systems and 277/480 volt systems shall not be mixed in the same race way, pull or junction box.

B. PRODUCT

1. All conductors shall be copper and shall conform to Underwriters' Standards. Wires No. 10 and smaller shall be solid. Wires 8 and larger shall be stranded.
2. All wire shall be labeled two (2) feet on centers giving size, type voltage, rating, and manufacturer's name. Wire #6 and smaller #6 shall be factory color coded. Wire larger than #6 may be color coded with Okonite 2000 volt colored tape at all terminals of the run, and at all junctions.
3. Where applicable, all wire shall be color coded as follows, or approved by the Engineer:

a. 120/208-volt system:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

b. 277/480-volt system:

Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	Natural Gray
Ground	Green

4. Insulation type shall be UL labeled for the appropriate type of use and temperature. Insulation types are as follows:
 - a. The insulation type for interior wiring shall be dual-rated THHN/THWN or XHHW.
 - b. The insulation type for wiring in exterior wet locations shall be THWN-2 or XHHW-2.

C. EXECUTION

1. Conductors shall be run in conduit and shall be continuous from outlet to outlet. Splices will not be made except within accessible outlet or junction boxes, troughs, or gutters.
2. Solid conductors shall be spliced by using Ideal "wing- nuts", 3M Company's "Scotchlok" connectors for branch circuit splices. Crimp connectors will not be allowed for branch circuit splicing.
3. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with U/L-approved insulating covers, may be used instead of mechanical connectors plus tape.
4. On mechanical splices, taps or joints taping shall be with at least two (2) layers of approved gum rubber tape which will be laid on the half-lap followed by at least one (1) layer of friction or plastic tape laid on with half-lap. It is intended that all taping shall be a permanently secured insulation equal to that of the wire.
5. All conductors in any conduit shall be at one specific voltage. Conductors of different voltages shall be run in separate conduits.
6. Neutral conductors shall be properly installed as to prevent grounding of the neutrals in any conduit. Multi-wire circuits with shared neutral conductors are not allowed. Each single pole load shall have individual neutral for each circuit.
7. Neatly train and lace wiring inside boxes, equipment, and panelboards.
8. Make conductor lengths for parallel circuits equal.
9. Pull all conductors into a raceway at the same time. Use third party approved wire pulling lubricant for pulling #4 AWG and larger wires.
10. Insulation Resistance Testing.

All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt insulation resistance testing. The procedures listed below shall be followed:

- a. 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.
- b. 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 insulation resistance testing reading between the neutral bar and

the 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 one separately to the panel 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 grounded panel can be achieved with only the neutral feeder disconnected.

- c. The contractor shall send a letter to the engineer certifying that the above has been done and tabulating the insulation resistance testing readings for each panel. This shall be done at least four (4) days prior to the final inspection.
 - d. At the final inspection, the contractor shall furnish an insulation resistance testing and demonstrate to the engineer and the **Franklin County Electrical Inspector** that the panels comply with the above requirements. The contractor shall also furnish a hook-on type ammeter and a voltmeter to take current and voltage readings as directed by the engineer and Construction office representative.
11. Use of split bolt connectors is not acceptable.
12. Prior to energizing, feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be included with the project record document.
13. Voltage Drop:
- a. Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drops on both feeders and branch circuits to the farthest outlet shall not exceed five percent (5%).
 - b. Where the conductor length from the panel to the first outlet on a 277-volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Conductor size of remaining branch circuit shall increase as needed to meet above voltage drop limitations.
 - c. Where the conductor length from the panel to the first outlet on a 120-volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Conductor size of remaining branch circuit shall increase as needed to comply with above voltage drop limitations.
 - d. Provide associated drawing modifications as needed for compliance with NEC Art 250.122(B) proportional increase in equipment ground conductor wherever ungrounded conductor sizes are increased for voltage drop.

END OF SECTION 26 05 20

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 05 33 BOXES AND CABINETS

A. GENERAL

1. The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
2. All necessary mounting hardware and accessories shall be provided for complete installation.

B. PRODUCT

1. Outlet and junction boxes shall be 4" minimum size, octagonal in ceilings, 4" square or rectangular (4" x 4" minimum for walls) except as noted below. Ceiling outlet boxes shall not be less than 1 1/2" deep, but in no case shall the size and depth of boxes be less than the required by the NEC.
2. Outlet boxes shall be equipped with plaster rings of appropriate depth to finish flush with finished walls. Outlets in exposed masonry wall shall be equipped with extra deep square corner tile rings so that box may be installed in the core of the block.
3. Outlets for concealed work and ceiling outlets for exposed work shall be galvanized stamped steel. Boxes shall be as manufactured by ABB-Steel City, Hubbell-RACO, Appleton or equivalent.
4. Wall outlets for exposed conduit work shall be Crouse-Hinds, Appleton, Hubbell-Killark or equal, series FS and FD switch and receptacle threaded hub boxes, with matching FS and FD covers.
5. Junction boxes for change of direction or feeder taps shall be furnished where required, shall be of adequate size to prevent crowding conductors in accordance with the requirements of the electrical code and job requirements and shall be accessible.
6. Junction boxes on finished wall and ceilings shall be flush with covers.
7. Junction boxes larger than 5" square shall be galvanized and without pre-formed knockouts.

C. EXECUTION

1. Boxes and troughs shall be supported independently of conduit entering them. Brackets, threaded rod hangers with lock nuts, bolts, or other suitable supporting methods may be used.
2. Thru-the-wall outlet boxes shall not be permitted. Outlet boxes shown back-to-back on plans, shall be separate boxes connected where required using a loop of flexible metallic conduit with ground wire. Boxes shall be separated a minimum of 18 inches apart.
3. In general, outlets shall be installed at the heights indicated on the fixture and symbol legend.
4. Each outlet designated on the plans shall be provided with an outlet box.
5. Each outlet box which supports a fixture shall be provided with a fixture stud into the outlet box. Outlet box and/or fixture stud shall be attached with not less than three screws or bolts.
6. Exterior outlets shall be provided with watertight gaskets and covers.

END OF SECTION 26 05 33

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 26 05 45 - CONDUIT AND CONDUIT FITTINGS

A. GENERAL

1. Conduit shall be delivered to the project site in bundles of full length pipes, each length marked with the trademark of the manufacturer and the Underwriters' Laboratories, Inc. stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.
2. Within the building parameters and above the floor slab, the rigid steel conduit specified shall be used unless specifically noted otherwise.
3. Conduit size for control wiring shall be a minimum of one-half (1/2) inch conduit. All branch circuit conduit shall be a minimum of one-half (1/2) inch. Percent filled and derating shall be in accordance with the National Electrical Code. Flexible metal and water-tite ("sealtite") conduit in size 1/2" and larger shall be acceptable for motor, appliance, and fixture connections from fixture junction boxes or appliance/motor disconnects provided a ground wire is installed in the flex and the flex assembly is an integral part of the fixture, shipped from the same factory as the fixture, and 3rd party agency approved for such use. The third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment. This same requirement shall apply for motor/appliance connections.
4. All conduit shall be installed in accordance with the National Electrical Code.
5. Metallic conduits shall be manufactured by Allied, Wheatland, Cruse-Hinds, or equivalents.
6. Non-metallic conduits shall be manufactured by Prime Conduit, Cantex, Champion Fiberglass or equivalents.
7. Conduit fittings shall be manufactured by Rayco, T & B, Crouse Hinds, O-Z/Gedney or equivalents.
8. Conduit fittings shall be manufactured by Rayco, T & B, Crouse Hinds, or equivalents.
9. Surface mounted raceway shall be used as noted on the plans in lieu of exposed conduit. Surface mounted raceway shall be manufactured by Wiremold or approved equivalents. A separate ground wire shall be run in the surface mounted raceway.

B. PRODUCT

1. Thin Wall Conduit and Fittings
 - a. Electrical metallic tubing (EMT) shall be cold-rolled steel tubing with zinc coating on the outside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating conforming to the latest requirements of ANSI. Conduit shall meet the Rigid Conduit Association Standards.
 - b. Electrical metallic tubing fittings shall be all steel plated hexagonal threaded compression type. No pot metal, indenter, or set screw fittings, shall be used. EMT connectors shall have insulated throats.
2. Rigid Steel Conduit and Fittings

- a. Rigid steel conduit, including elbows and nipples, shall be standard weight, mild steel pipe, hot dipped galvanized, sherardized or zinc-coated conforming to the requirements of ANSI C80.1, 1966 or later edition. Rigid steel conduit shall also meet the latest requirements of Underwriters' Laboratories, Inc. Standards for Rigid Metallic Conduit.
 - b. Fittings shall be all steel plated hexagonal threaded fitting.
3. Flexible Metal Conduit and Fittings
- a. Flexible metal conduit shall be of the best grade interlocking spiral strip steel. The interlocking spiral strip construction shall be such as to permit bending of the conduit to a radius of four (4) times its internal diameter without distorting at any point. The interior and the exterior of the flexible conduit shall be smooth and free of burrs, sharp edges, or other defects which could damage the wire.
 - b. Fittings shall be of the approved types, made of malleable iron and hot dipped galvanized.
 - c. All connectors shall be steel compression fittings with insulated throats.
 - d. Where water tight flexible conduit is required, it shall have an outer sheath of material similar to PVC.
4. Non-metallic Conduit
- a. Non-metallic conduit shall be UL listed, for its particular application. It shall be resistant to sunlight and chemical and moisture atmospheres and rated for use with 90 degrees Celsius conductors.
 - b. The installation and usage of rigid non-metallic conduit shall comply with Article 352 of the National Electrical Code, along with any related or referenced sections.

C. EXECUTION

1. General

- a. All conduit shall be run tight against walls, columns or ceilings.
- b. The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending. Conduit bends shall have a radius not less than ten (10) times the conduit diameter.
- c. Where conduits join any couplings or threaded fittings, the ends shall be made watertight. (All conduit runs, including boxes, couplings, and fittings used therein, shall be so installed and equipped as to prevent water from entering the conduit.)
- d. All conduits shall be carefully cleaned before and after erection. After cleaning, all ends of conduits shall be free from burrs and inside surfaces shall be free from imperfections likely to injure the wires or cables.

- e. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded.
 - f. In unfinished areas, exposed conduit shall be run to conform to the building lines with special emphasis on neatness. Turns shall be made with galvanized outlet boxes, junction boxes, factory fittings and/or symmetrical bends. Locknuts and bushings shall be employed to provide full grounding and adequate protection of insulation. Double locknuts shall be used on all conduits entering sheet metal enclosures.
 - g. Support for all conduit shall be in accordance with the National Electrical Code. Conduit shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry; expansion shields and matching screws or standard pre-set inserts on concrete or solid masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. Powder actuated fasteners are not permitted.
 - h. All empty conduit systems shall be capped or terminated in a junction box and shall be provided with nylon pull cord inside for future use.
 - i. Conduit terminating below grade shall be provided with means to prevent entry of dirt or moisture. Depth of burial shall not be less than two (2) feet below grade. All termination points shall be accurately marked and dimensioned on the As-Built Plans.
 - j. Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting" compatible with the type of raceway shall be provided.
 - k. Conduits installed on the interior of exterior building walls shall be spaced off the surface a minimum of 1/4" using "clamp-backs" or strut.
2. Thin Wall Conduit and Fittings
- a. Except for service and feeder conduits, electrical metallic tubing and fittings may be installed in lieu of rigid conduit in dry construction in furred spaces, ceiling cavities, chase spaces, interior portions other than concrete and solid plaster, or for exposed work except on mechanical structure or supports.
 - b. Electrical metallic tubing shall not be installed.
 - 1) Where exposed to severe corrosive conditions and/or severe physical damage,
 - 2) Nearer than four (4) feet from finished floor in exposed areas
 - 3) In trade sizes larger than two (2) inches
 - 4) Located in exterior walls or in poured concrete.
 - 5) Any location outdoors.
 - 6) Where tubing, coupling, elbows and fittings would be in direct contact with the earth or underground (in/below slab-on-grade or in earth).

- c. A transition between a run of rigid conduit concealed in a wall and a run of thin wall conduit along a ceiling shall be made in an outlet box above the ceiling, if accessible, near the wall.
- 3. Rigid Steel Conduit and Fittings
 - a. All conduit terminations shall be provided with insulating bushings.
 - b. Condulet fittings shall not be used in lieu of pull boxes.
 - c. Except where located under the ground floor slab, all service and feeder conduit shall be heavy wall (rigid galvanized).
 - d. Rigid steel conduit shall be installed in exterior masonry walls, in wet locations where subject to severe physical damage, or where conduit trade size is two and one half (2 1/2) inches or larger.
- 4. Flexible Metal Conduit and Fittings
 - a. Flexible metallic conduit shall be provided at the end of each conduit run terminating at the conduit box on electric motors, transformers or other equipment.
 - b. The length of flexible conduit shall be in accordance with the National Electric Code.
- 5. Non-Metallic Conduit
 - a. Thin wall rigid non-metallic conduit (schedule 40 PVC) shall only be used for concrete encasement.
 - b. Except where embedded in concrete, conduit shall be supported to permit adequate lineal movement to allow for expansion and contraction of conduit due to temperature change. Where a temperature change in excess of 14 degrees Celsius is anticipated, such as direct burial, exposed outside of the building, or in un-insulated spaces inside the building (attics, crawl spaces, etc.), expansion joints shall be installed in accordance with the manufacturer's specifications.
 - c. Heavy wall non-metallic conduit (schedule 80 PVC) shall be used where conduits are direct buried exterior to the building or exposed exterior to the building.
 - d. PVC schedule 40 shall not be used exposed or concealed in gypsum wall, but may be used in CMU walls. PVC schedule 40 may be used in elevated floor slabs and in foundation slabs. Minimum concrete cover shall be 3/4 inch at finished or formed surface and shall be 3 inches at concrete surface cast against earth or for slabs placed on-grade. Greater amounts of concrete cover shall be used in areas subject to damage. The placement of conduit in floor slabs must be thoroughly coordinated with the structural design. Potential conflicts with steel reinforcing bars and reductions in net concrete sections are among the issues that must be considered by the structural engineer.
- 6. Underground Raceways
 - a. Where conduit is installed under the ground floor slab within the building foundations, schedule 40 PVC conduit shall be used. At the Contractor's option, this installation may consist of galvanized steel conduit encased with three (3) inches of concrete or rigid steel conduit with a minimum of 15 mils of PVC coating. Where thin wall non-

metallic conduit is used under the ground floor slab, the elbows and turn out required to turn the raceway up into cabinets, equipment, boxes, etc. shall be of rigid steel.

- b. Raceways run external to building foundation walls, with the exception of branch circuit raceways, shall be encased with a minimum of three (3) inches of concrete on all sides.
 - 1) Encased raceways must have a minimum cover of eighteen (18) inches, except for raceways containing circuits with voltages above 600 volts, which must have a minimum cover of thirty (30) inches.
 - 2) Encased raceways shall be of a type approved by the NEC as "suitable for concrete encasement."
- c. Branch circuit raceways run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC, and shall be of a type approved by the NEC as "suitable for direct burial." Minimum raceway size shall be 1 inch.
- d. All underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- e. Raceways run underground internal to building foundation walls shall be of a type and installed by a method approved by the NEC.
- f. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the stub-up out of the slab or earth shall be of rigid steel.
- g. The raceway system shall not be relied on for grounding continuity.
- h. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fitting with "FSKA" membrane clamp adapter if required.

7. Ductbank

- a. Excavation and backfill shall conform to "Division 2" of the specifications except heavy-duty, hydraulic-operated compaction equipment shall not be used.
- b. Trenches should be cut neatly and uniformly, sloping uniformly to required pitch.
- c. Ducts should be pitched to drain toward manholes and handholes and away from buildings and equipment. Minimum slope shall be 4 inches in 100 feet. Where necessary to achieve this between manholes, ducts should be sloped from a high point in the run to drain in both directions.
- d. Concrete encased nonmetallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Separators to the earth and to ducts should be secured to prevent floating during placement of concrete. Steel or tie wires should not be used in such a way as to form conductive or magnetic loops around ducts or duct groups.

- e. Waterproof marking cord should be installed 130-pound tensile test (marked at least every foot), equivalent to Greenlee No. 435, in all ducts, including spares, after thoroughly rodding, clearing and swabbing all lines free of any and all obstructions.
- f. All ducts should be sealed at terminations, using sealing compound and plugs, as required to withstand 15 psi minimum hydrostatic pressure.
- g. The arrangement of conduit in ductbank should be in accordance with OSHA requirements.

END OF SECTION 26 05 45

SECTION 26 05 53 – ELECTRICAL IDENTIFICATION

A. GENERAL

1. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project.
2. Identify all disconnecting means in accordance with NEC 110.22(A).
3. Furnish and install self-adhesive plastic tape for all receptacle and wall switch cover plates indicating circuit numbers.

B. PRODUCT

1. Nameplates:
 - a. Nameplates shall remain legible. Embossed, self-adhesive plastic tape is not acceptable for marking equipment.
 - b. Nameplates shall include the equipment designation, voltage, and source of feeder.
 - c. Name plates shall be laminated phenolic plastic with engraved letter. Letters shall be approximately 1/2-inch high except where resultant nameplate size exceeds equipment size. Nameplate lettering may be adjusted accordingly with approval of the Engineer.
 - d. Nameplate material colors shall be:
 - Blue surface with white core for 120/208-volts equipment.
 - Black surface with white core for 277/480-volts equipment.
 - Bright red surface with white core for all equipment related to fire alarm system.
 - Dark red (burgundy) surface with white core for all equipment related to security.
 - Green surface with white core for all equipment related to emergency systems.
 - Orange surface with white core for all equipment related to telephone systems.
 - Brown surface with white core for all equipment related to data systems.
 - White surface with black core for all equipment related to paging systems.
 - Purple surface with white core for all equipment related to TV systems.
2. Self-adhesive plastic tape:
 - a. All text shall be type written by the tape compatible equipment. No handwritten.

C. EXECUTION

1. Nameplates shall be securely attached to equipment using two-part epoxy adhesive suitable for location where installed. In outdoor locations, labels applied using two-part epoxy shall be weatherproof and sunlight resistant.
2. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.
3. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation.

END OF SECTION 26 05 53

SECTION 260800 - ELECTRICAL COMMISSIONING REQUIREMENTS

A. GENERAL

1. DESCRIPTION

- a. Commissioning
Commissioning is a systematic process of ensuring that all building systems perform interactively according to the owner's project requirements and operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing adjusting and balancing, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives:
- b. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
- c. Verify and document proper functional performance of equipment and systems.
- d. Verify that O&M documentation left on site is complete.
- e. Verify that the Owner's operating personnel are adequately trained.

2. RELATED WORK

- a. Section 23 09 00 – Instrumentation and Controls for HVAC

3. ABBREVIATIONS AND DEFINITIONS

- a. A/E: Architect, Architect/Engineer, Engineer and/or Design-Builder
- b. ASI: Architectural Supplemental Instruction
- c. BAS: Building Automation System
- d. BoD: Basis of Design. A narrative of how the designer plans to achieve the OPR.
- e. CxA: Commissioning Authority
- f. CC: Controls Contractor
- g. CM: Construction Manager
- h. Cx: Commissioning
- i. Cx Plan: Commissioning Plan
- j. DDC: Direct Digital Control System
- k. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents and cannot be corrected in five (5) minutes time.
- l. FT: Functional Performance Test

- m. MC: Mechanical Contractor
 - n. O&M: Operation and Maintenance
 - o. OPM: Owner Project Manager
 - p. OPR: Owner Project Requirement. A dynamic document expressing how the owner expects the building systems to perform upon project completion.
 - q. PC: Prefunctional Checklist
 - r. Sub(s): Subcontractors or Prime Contractor
 - s. TAB: Test, Adjust and Balance
4. Electrical EQUIPMENT AND SYSTEMS TO BE COMMISSIONED
- a. Electrical Systems
 - 1) Service Switchboard
 - 2) Motor control centers.
 - b. Lighting Control Panel.
 - c. Electric metering Interface with Building Automation System
5. SUBMITTALS
- a. Provide the CxA a copy of the following items, for the systems to be commissioned:
 - b. Equipment and System Submittals to include, at minimum, the following:
 - 1) Equipment Data Sheets
 - 2) Performance data
 - 3) Manufacturer's pre-startup checklists
 - 4) Manufacturer's start-up checklists
 - 5) Installation Instructions
 - c. Shop drawings (including any resubmittals required by the A/E)
 - d. Piping - Supply one copy of all hydrostatic pressure test results
 - e. Initial Pre-startup and start-up plan
 - f. Startup Testing Report
 - 1) Prepare startup testing report on a per system basis, documenting the results of executed testing plan.

- 2) Copies of all completed test forms and checklists shall be provided.
 - 3) List of all outstanding deficiencies and uncompleted items.
 - g. Operational and maintenance documentation
 - h. Training plan and training materials
 - i. As-built documentation
- 6. SEQUENCE OF OPERATIONS
 - a. Not Applicable.
- B. PRODUCTS
 - 1. TEST EQUIPMENT
 - a. Instrumentation required to verify readings and test system and equipment performance shall be provided by Contractor and made available to Commissioning Authority. Refer to respective specification sections for testing procedures.
 - 2. Cx WEB-BASED COMMISSIONING TOOL
 - a. All web-based software required to verify readings and test system and equipment performance shall be provided by Contractor and made available to Commissioning Authority. Refer to respective specification sections for testing procedures.
- C. EXECUTION
 - 1. MEETINGS
 - a. Prior to the start of construction, the mechanical and controls contractor will schedule a meeting with the commissioning authority to review the systems to be commissioned, the testing methodology, and other requirements.
 - 2. START-UP, PRE-FUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT
 - a. General
 - 1) Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
 - 2) The prefunctional performance test checklists shall be developed by the CxA.
 - b. Start-up and Initial Checkout Plan
 - 1) The subcontractor responsible for providing and installing the equipment shall develop the full start-up plan by combining the prefunctional checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and

procedures with specific boxes or lines for recording and documenting the checkout and inspection of each piece of equipment and a summary statement with a signature block at the end of the checklist.

- 2) The full start-up plan shall consist of:
 - The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end
 - The manufacturer's normally used field checkout sheets
 - Specifically, the mechanical start-up plan shall also include the contractors TAB plan.
- 3) The contractor submits the full startup plan to the CxA for review and approval.
- 4) The CxA reviews and approves the procedures and the format for documenting them, noting any plans that need to be added.

c. Execution of Prefunctional Checklists and Startup

- 1) Two weeks prior to startup, the Subs and vendors schedule startup and checkout with the OPM, CM and CxA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
- 2) The CxA and possibly the A/E will observe the procedures for selected pieces of primary equipment. It is the intent that the commissioning authority will observe the tests during contractor testing. If the contractor does not inform the commissioning authority of testing, the commissioning authority may request the contractor to repeat the test.
- 3) The CxA will observe the physical start-up of all major systems.
- 4) For lower-level components of equipment, (e.g., sensors, controllers), the CxA will observe a sampling of the prefunctional and start-up procedures.
- 5) The Subs and vendors shall execute startup and provide the CM with a signed and dated copy of the completed start-up and prefunctional tests and checklists. The CM reviews for completion and accuracy, then submits to the CxA.
- 6) Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.
- 7) Completed startup test report must be provided to CxA prior to functional testing.

d. Deficiencies, Non-Conformance and Approval in Checklists and Startup

- 1) The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully. The procedures form and any outstanding deficiencies shall be provided to the CxA within two days of test completion.

- 2) The CxA will work with the Subs and vendors to determine what is required to correct outstanding deficiencies and retest deficiencies of uncompleted items. The CxA will involve the PM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected.
- 3) Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party.

3. FUNCTIONAL PERFORMANCE TESTING

- a. This sub-section applies to functional testing and demonstration for equipment and system in this division. The functional testing check list shall be developed by the CxA.
- b. The general list of equipment and systems to be commissioned is found in section 1.4.
- c. Objectives and Scope
 - 1) The objective of functional performance testing is to demonstrate that each system is operating according to the owner's project requirements, documented project program, and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and function of the systems.
 - 2) In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, failures, interlocks, warm-up, safety, etc.) where there is a specified system response. Verifying each sequence in the sequence of operation is required.
 - 3) Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
 - 4) The contractor shall supply all personnel and equipment for the demonstration, including, but not limited to, tools, instruments, ladders, lifts, computers, software, cables, etc. Contractor supplied personnel must be competent with and knowledgeable of all project-specific systems, and automation hardware and software. All training documentation, submittals, installation manuals, and O&Ms, shall be at the job site before functional testing commences.
- d. Development of Test Procedures
 - 1) The CxA develops specific functional test procedures and forms to verify and document proper operation of each piece of equipment and system. The CxA provides a copy of the test procedures to the A/E, OPM and installing Sub who shall review the tests prior to testing. The A/E and Sub(s) shall point out to the CxA any specific problems related to feasibility, safety, equipment and warranty protection.
- e. Coordination and Scheduling
 - 1) The CM shall provide sufficient notice to the CxA regarding the Subs completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests after written notification from the

CM and affected Subs. Completed startup testing report must be provided to CxA prior to functional testing. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

- 2) In general, functional testing shall not be scheduled until all hardware and software submittals are approved, Prefunctional checklists are approved, and start-up has been satisfactorily completed. Functional testing of the equipment and systems listed in section 1.4 of this specification section shall not be conducted out of the presence of the CxA and OPM, unless specifically approved to do so in writing by the CxA or OPM. Any functional testing which occurs outside the presence of the CxA or OPM without written authorization to do so will be required to be re-tested at no expense to the owner.

f. Test Methods

- 1) Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers.
- 2) Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
- 3) Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair dryer rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
- 4) Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
- 5) Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout setpoint to be 2°F above the current outside air temperature.
- 6) Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
- 7) Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the

necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

g. Demonstration, Verification and Validation

- 1) Total Energy meter shall be tested for totalization.
- 2) Lighting control systems shall tested for operation.
- 3) Motor Control Center:
 - a. Control panels shall be tested for operation.
 - b. MCC shutdown shall be tested for operation.

h. Problem Solving

- 1) The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, Subs and A/E.

4. OPERATION AND MAINTENANCE MANUALS

- a. In addition to Installation manuals, the contractor shall provide one copy of the Operation and Maintenance Manuals to the CxA for the systems to be commissioned. The O&M Manuals shall be provided to the CxA at least 8 weeks prior to the start of Functional Testing. O&M Manuals shall be in electronic form, the file format shall be Adobe Acrobat readable document. The document shall be formatted to include level 1 bookmarks that link to each main section of equipment.

5. TRAINING OF OWNER PERSONNEL

- a. CxA shall document the completion of comprehensive Owner training. Training shall include the understanding of the systems and the operation and maintenance of each major piece of HVAC equipment, motor control centers or system.
- b. Training shall include classroom sessions, if necessary, followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation.

END OF SECTION 260800

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 22 13 - DRY TYPE TRANSFORMERS (480V DELTA - 120/208V WYE, 3 PHASE, 4 WIRE)

A. GENERAL

1. The Electrical Contractor shall provide dry type transformer(s) of the size and type as shown on the engineering plans.
2. Transformer(s) shall be manufactured by Square D, ABB, Siemens, Eaton or other approved equal.

B. PRODUCT

1. Transformer(s) shall be 480-volt delta to 120/208-volt, three (3) phase, four (4) wire "Y" of the size(s) shown. Transformer(s) shall be energy efficiency type. Minimum transformer efficiencies must satisfy efficiencies promulgated within the United States Code of Federal Regulations CFR Title 10 Chapter II Part 431 (Appendix A of Subpart K 2016) commonly referred to DOE 2016 Efficiency Levels.
2. Transformer shall be insulated with a 220°C temperature insulation system. Transformer shall be 115°C temperature rise and floor mounted with vibration isolation pads provided. Transformer shall be capable of carrying a 15% continuous overload, without exceeding a 150 °C rise. Required performance shall be obtained without exceeding the above rise in a 40°C maximum, 30°C average ambient temperature. Where floor mounted units are suspended, the type of suspension and vibration isolation shall be as detailed on the plans.
3. Six 2 1/2% taps, two above and four below normal shall be provided.
4. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable Underwriters' Laboratory and National Electric Code standards.
5. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above 40°C ambient.

C. EXECUTION

1. Transformer(s) shall be installed in accordance with manufacturer's instructions and in compliance with the National Electric Code.
2. Unit(s) shall be appropriately secured to a 3 1/2" high concrete pad furnished by the Electrical Contractor. The pad shall be 2500 PSI concrete and the pad size shall be greater than the transformer(s) size by a minimum of 4".
3. Make connections to transformer(s) with a minimum of one (1) foot of flexible conduit.

END OF SECTION 26 22 13

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 262413 - SERVICE ENTRANCE SWITCHBOARD

A. GENERAL

1. The Electrical Contractor shall provide a main service entrance switchboard as shown on the drawings and as contained herein.
2. The switchboard(s) shall meet Underwriter's Laboratories enclosure requirements and shall be Square D by Schneider Electric, Eaton, ABB, or SIEMENS.
3. The switchboard(s) shall be U.L. listed, as suitable for use as a service entrance equipment, and bear all U.L. service equipment label.

B. PRODUCT

1. Enclosure Construction
 - a. The switchboard framework shall be fabricated on a die-formed steel base or base assembly consisting of formed steel and commercial channel welded or bolted together to rigidly support the entire shipping unit for moving on rollers and floor mounting. The framework is to be formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing, and component devices during shipment and installation.
 - b. Each switchboard section shall have an open bottom and individual removable top plate for installation and termination of conduit. Top and bottom conduit area is to be clearly shown and dimensioned on the shop drawings. The wireway front covers are to be hinged to permit access to the branch switch load side terminals without removing the covers. All front plates used for mounting meters, selector switches or other front mounted devices shall be hinged with all wiring installed and laced with flexibility at the hinged side. All closure plates shall be screw removable and small enough for each handling by one man. The paint finish shall be gray enamel over a rust-inhibiting phosphate primer.
 - c. The enclosure shall be front accessible only.
2. Bussing
 - a. The switchboard bussing shall be copper with silver plating and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum temperature rise of 50 degrees Celsius, above an ambient temperature of 25 degrees Celsius.
 - b. The main horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. Bus bars in the distribution section shall be of full length, to allow for future addition of circuit breakers up to the maximum number allowable for this size switchboard. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of required periodic maintenance.

3. Integrated Equipment Rating

- a. The bus bars shall be rigidly braced for a minimum 65,000-amp fault current (symmetrical), or as shown on the plans.
- b. Each switchboard, as a complete unit, shall be given a single integrated equipment rating by the manufacturer. The integrated equipment short-circuit rating shall certify that all equipment is capable of withstanding the stresses of a fault equal to that of the least overcurrent protective device contained therein or as specified. Such rating shall be established by actual tests by the manufacturer on a similar equipment construction as the subject switchboard. This test data shall be available and shall be furnished to the Engineer with the submittal of approval drawings.
- c. Provide phase loss protection with capacitor system back up.

4. Main Circuit Breakers

- a. The service disconnect shall be equivalent to Square D Company PE type breaker, 100% rated with fixed mounted construction.

All trip unit adjustments shall be factory coordinated and set with the secondary breakers within the switchboard. Submit coordinated study to engineer for approval.

5. Molded Case Circuit Breakers

- a. All devices shall be U.L. listed and meet the latest version, as of the bid date, of NEMA Standards, Publication No. AB1.
- b. The breakers shall be quick-make and quick-break type. The breakers shall have wiping type contacts, arc chutes and common trip mechanisms for three pole breakers.
- c. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees Celsius.
- d. All breakers shall of the minimum interrupting rating specified and of the trip size shown on the plans.

6. Maintenance Mode Switches:

- a. Description: Local, lockable switch with blue status indicator light that permits selection of maintenance mode with alternate electronic trip unit settings for reduced fault clearing time in accordance with NFPA 70.
- b. Provide for circuit breakers 1,200 A and larger.
- c. Switch Type: Provide [energy reduction maintenance settings (ERMS) switches
 - 1) ERMS Switches: Clearing time of less than 50 milliseconds when activated.
- d. Insulated Case Circuit Breakers (ICCBs) and Power Circuit Breakers (PCBs) with ERMS: Provide Android/iOS mobile application that enables remote maintenance mode activation, at distance typically greater than 33 feet (10.1 m) line-of-sight.

7. Power Metering:

- a. Factory installed, integrated within switchboard.

- b. BACNET MS/TP connectivity.
- 8. Surge protection:
 - a. Factory installed, integrated within switchboard.
- 9. Additional Features
 - a. Factory finish gray paint application.
 - b. Commercial channel base.

C. EXECUTION

- 1. The switchboard(s) shall remain in the manufacturer's container(s) until such time that the unit(s) can be set and assembled. Once the equipment has been received at the job site, it shall be stored to prevent physical damage from weather or construction.
- 2. Provide a 4" thick concrete pad, 3000 psi with leveling channels in the floor construction for mounting of the switchboard.
- 3. The manufacturer's representatives shall inspect the equipment after installation and certify in writing to the Engineer that the equipment had been installed in accordance with the manufacturer's recommendations. In addition, the operation of all devices shall be checked by the manufacturer's representative in the presence of the Engineer.
- 4. Where the switchboard is specified with the Ground-Fault Protection of Equipment main breaker, testing of the ground fault protection system at the job site shall be performed by a qualified person(s) using primary current injection in accordance with the instructions provided with the equipment and in accordance with NEC 230.95(C). All readings shall be tabulated by the contractor. A written record of the testing shall be provided to the AHJ and the engineer of the record.
- 5. Upon completion of installation, and prior to final inspection, the contractor shall reduce in size the as-built riser diagram, frame same under glass and mount in a conspicuous place adjacent to the switchboard.
- 6. Switchboards identified for use as service equipment shall be labeled.

END OF SECTION 262413

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 24 16 - PANEL BOARDS AND CIRCUIT BREAKERS

A. GENERAL

1. The Electrical Contractor shall provide all panelboards and circuit breakers as shown on the plans in accordance with this specification.
2. All equipment shall meet UL, NEC and NEMA Standards as applicable to the equipment specified herein.
3. All panelboards shall be equipped with a main circuit breaker or main lugs as indicated on the drawings.
4. All panelboards shall be equipped with branch breakers as shown on the drawings.
5. All panelboards identified on the drawings for use as service equipment shall be so labeled and UL listed for such use.
6. Full size insulated copper neutral bars shall be included in all panelboards. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
7. A copper ground bus shall be included in all panelboards.
8. All current-carrying parts of the bus assembly shall be copper with tin plating.
9. Panelboards shall be labeled with a UL short circuit rating not less than the rating indicated on the drawings.
10. The word "spare", unless noted otherwise on the panel schedules, shall be a single pole, 20 amp circuit breaker.
11. The word "space", unless noted otherwise on the panel schedules, shall be for a space in the panelboard for a standard size, single pole circuit breaker.
12. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
13. Sub fed breakers are not acceptable.
14. Series rated panel boards or breakers are not acceptable.
15. All NEMA 1 panel boards shall have a hinged trim (Door in Door).
16. All panelboards shall have breakers, terminals, and Lugs UL approved use with 75°C rated conductors.

B. PRODUCT

1. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	240	Maximum Branch Circuit	=	125 amps
Amps	=	600	Short Riding Circuit	=	22,000 amps

- a. Panelboards shall be Square D Company type NQ (bolt- on) or equivalent by Siemens, Eaton, or ABB.
 - b. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
 - c. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
 - d. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Door shall be mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
 - e. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.
2. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	480	Maximum Branch Circuit	=	125 amps
Amps	=	600	Short Circuit Rating	=	65,000 amps 480 VAC = 100,000 amps 240 VAC

- a. Panelboards shall be Square D Company Type NF (bolt- on) or equivalent by Siemens, Eaton, or ABB.
- b. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- c. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- d. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Door shall be

mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.

- e. Panelboard trims shall cover all live parts. Switching device handles shall be accessible
3. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	480	Maximum Branch Circuit	=	1,200 amps
Amps	=	1,200	Short Riding Circuit	=	200,000 amps

- a. Panelboards shall be Square D Company, Type I-Line or equivalent by Siemens, Eaton, or ABB
 - b. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel are to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with NEMA, UL and NEC Standards for panelboards. Cabinets are to be equipped with spring latch and tumbler-lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. End walls shall be removable. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.
 - c. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breaker shall be barriered on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall be barriered.
 - d. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door.
4. Molded Case Circuit Breakers

- a. This specification covers molded case circuit breakers rated 15 through 1200 amperes 120VAC, 240VAC, 277VAC and 480VAC. Breakers covered under this specification may be installed in switchboards, panelboards, motor control centers, combination motor starters, busway plugs and individual enclosures.
- b. Circuit breakers shall be manufactured by Square D Company of the size as indicated on the drawings or equivalent by Siemens, Eaton or ABB. All breakers shall be bolt-on type.
- c. All circuit breakers shall have a quick-make, quick- break over center toggle type mechanism. The handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breakers shall assume a position between on and off when tripped automatically. Multi- pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings shall be clearly visible.
- d. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100%

rated current in an ambient of 40 degrees Celsius. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40 degrees Celsius, the circuit breaker automatically derates itself so as to better protect its associated conductor. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes 250 amps and above.

- e. The interrupting rating of each circuit breaker shall be as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to UL listed integrated short circuit current rating specified for the panelboards and switchboards.
- f. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120 V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.
- g. Motor starters, and other applications as indicated on drawings, shall be furnished with magnetic-only type molded case circuit breakers. Each breaker shall be provided with a single magnetic adjustment that will set all poles to the same trip current. Adjustment shall be continuous throughout the adjustable trip range. The magnetic trips shall be accessible from the front of these circuit breakers.

C. EXECUTION

- 1. Panelboards shall be flush or surface mounted as shown on the plans.
- 2. Panel enclosures shall not be used as junction or pull boxes for splicing conductors.
- 3. Each flush mounted panel shall be equipped with two empty one inch conduits sealed in the wall from a panel to a six inch square flush mounted box installed above a lay-in type ceiling or flush in the wall at the ceiling for a plaster or spline type acoustical tile ceiling.
- 4. All panels shall be equipped with neatly typed directory cards attached on the inside of the door.
- 5. GFI circuits shall be tested by the Contractor prior to the pre-final inspection.
- 6. Testing of the ground fault protection system at the job site shall be performed by a qualified person(s) using primary current injection in accordance with the instructions provided with the equipment and in accordance with NEC 230.95(C). All readings shall be tabulated by the contractor. A written record of the testing shall be provided to the AHJ and EOR.
- 7. The number of branch circuit shall be identified with permanent wire tag attached to the wire.
- 8. Arc Flash Hazard Assessment:
 - a. After submittals have been approved, the contractor shall furnish a complete analysis of the available arc fault from the service entrance down to the 120/208V bus level.

- b. The report shall include the following:
 - 1. Data entry and system one-line modeling in SKM or equivalent modeling software.
 - 2. Arc Flash Hazard Assessment to include the following:
 - i. Short Circuit Study
 - ii. Protective Device Coordination
 - iii. Arc Flash Evaluation Report
 - iv. Arc Flash Bus Detail
 - v. Energized Work Permits
 - vi. Single-line Drawings of electrical equipment
 - 3. Arc Flash Hazard Labeling
- c. Furnish 1 hard copy and 1 electronic copy of the report to the EOR and the owner.
- d. The contractor will be responsible for verifying breaker types, estimating feeder lengths, and determining conductor types.
- e. The contractor will be responsible for applying arc flash labels to panels.
- f. The contractor shall adjust the settings of adjustable trip breakers as directed by the protective device coordination study.

END OF SECTION 26 24 16

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 27 26 - WIRING DEVICES

A. GENERAL

1. Switches, dimmer switches, photocell, contactors and receptacles, with proper cover plates, shall be provided where indicated on the Drawings.

B. PRODUCT

1. Switches, dimmer switches, photocell, contactors and receptacles shall be as specified in the Symbol Schedule of the Drawings.
2. All switches and receptacles shall be federal specification grade meeting NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL-498 and shall be approved third-party listed.
3. Switches and receptacles shall be as manufactured by Hubbell, Legrand, Leviton, Eaton, or approved equal. Photocells shall be manufactured by Tork, Paragon, Bryant, or equivalent.
4. Cover plates for all wall mounted devices shall be provided as scheduled on the Drawings. Where covers are not specified, they shall be as follow:
 - a. Interior: type 302 stainless steel. Cover plate mounting screws shall be slotted head oval screws and shall match the finish and material of the plate and shall be furnished with the plate by the plate manufacturer.
 - b. Exterior, exposed work and wet locations: cover plates shall be extra-duty rated (NEC 406.9(B)(1)) galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated on the drawings. Exterior mounted switch and receptacle plates, and those noted to be weatherproof, shall be weatherproof cover plates, standard size, single or ganged as indicated on the drawings, and shall be "approved" third party listed as "rain-tight while in use."
5. All devices shall have a hex-head green grounding screw for use in connecting device to green grounding conductor run in the conduit system.
6. All GFI devices shall be the feed through type.
7. All standard duplex receptacles shall be 20 amp, 125 volt rated, and tamper resistant.
8. All devices subject to use in a wet location shall be listed as weather resistant.
9. All switches shall be rated 20 amp, 120/277 volt. Toggle switches shall have quiet operating mechanisms without the use of mercury switches.

C. EXECUTION

1. Mounting height shall be as indicated on the Drawings. Coordinate with other trades so that devices will miss equipment installed by others.
2. Where two or more devices are ganged, they shall be in a common box with a ganged plate.
3. All devices shall have a green ground conductor to run parallel with the phase conductor back to the electrical panel.
4. In all areas where carpet is to be installed as finished floor material, unless otherwise specified, the Electrical Contractor will furnish solid brass carpet flanges for installation on floor outlet boxes. Flanges will be furnished and installed on all active outlets after the carpet is installed. Where a specified number of outlet fittings are to be furnished to the Owner, for each fitting not installed during the construction period, it will be turned over to the Owner with the receptacle, carpet flange and all necessary appurtenances.
5. Provide quantity of 2% spare cover plates of each type to the owner.

END OF SECTION 26 27 26

SECTION 26 27 27 – DISCONNECTS

A. GENERAL

1. Disconnect switches shall be provided where indicated on the drawings, or as required by the National Electrical Code (NEC).

B. PRODUCT

1. Disconnects shall be heavy duty as manufactured by Square D Company, Siemens, Eaton, ABB, or approved equal.
2. Disconnects shall be furnished with factory finish paint and appropriate knockouts for conduit connections.
3. All disconnects shall have side hinged type doors. Front operated handles will not be permitted.
4. All fused disconnects shall be equipped with positive pressure fuse clips and shall have visible disconnecting blade switches.
5. NEMA 1 enclosures shall be provided where installed indoors. NEMA 3R enclosures shall be provided where exposed to the elements, unless noted otherwise.
6. All disconnects shall have copper bus.
7. Disconnects shall have provisions for locking in on and off positions.
8. Disconnects shall have defeatable door interlocks that prevent the door from opening when the operating handles is in the "on" position.
9. Disconnects shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlocks shall be provided for switches located in the public areas.
10. Provide appropriate auxiliary contacts if the disconnect switch is used upstream of elevator controllers, variable drives, etc. that require signal before power is removed.

C. EXECUTION

1. Disconnect switches shall be mounted as indicated on the Drawings and shall be independently supported. Conduits entering the disconnect switch shall not be used to support switches.
2. Where fused disconnect switches are required or shown on the plans, standard fuses shall be used unless the switch protects an individual motor circuit, then dual element fuses shall be used.
3. The electrical contractor shall provide to the owner the spare fuses, 10% of the quantity of fuses used of each type and rating, with a minimum of one set of each type.

END OF SECTION 26 27 27

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 26 32 13 – SPARK IGNITED ENGINE-DRIVEN GENERATOR SETS

A.GENERAL

1 SUMMARY

a. Section Includes:

1. Spark-Ignited Engine.
2. Natural Gas Fuel Supply System.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure (where selected).
7. Vibration isolation devices (where applicable).

b. Related Requirements:

1. Section 263623 "Automatic Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

2 DEFINITIONS

a. EPS: Emergency power supply.

b. EPSS: Emergency power supply system.

c. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

3 ACTION SUBMITTALS

a. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactance, and short-circuit current capability.

b. Shop Drawings:

1. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight for provided components; fuel tank,

- enclosure, silencer, base tank, each piece of equipment not integral to the engine generator.
- 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Identify fluid drain ports and clearance requirements for proper fluid drain.
- 4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
- 5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
- 6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams indicating terminal markings for engine generators and functional relationship between all electrical components.
- 7. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

4 INFORMATIONAL SUBMITTALS

- a. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- b. Source Quality-Control Reports: Including, but not limited to, the following:
 - 1. Certified summary of prototype-unit test report. Perform tests at rated load and power factor. Provide the following test results:
 - a. Maximum Power Level
 - b. Maximum Motor Starting (sKVA)
 - c. Structural Soundness
 - d. Torsional Analysis
 - e. Transient Response
 - f. Alternator Temperature Rise
 - g. Engine Cooling Requirements (unit mounted radiator)
 - h. Harmonic Analysis (per IEEE-115 and ANSI-100)
 - i. Voltage Regulation
 - j. Endurance Testing
 - 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 - 3. Report of factory test on units to be shipped for this Project, indicating evidence of compliance with specified requirements.
 - 4. Report of sound generation.
 - 5. Report of exhaust emissions indicating compliance with applicable regulations.
 - 6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- c. Field quality-control reports. Field start up report and unit in-service documentation, including load bank test results if applicable.

5 CLOSEOUT SUBMITTALS

- a. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. Include manufacturer's recommended maintenance and periodic testing plan in accordance with NFPA 110, Chapter 8.
- b. Furnish extra materials required by local Authority Having Jurisdiction (AHJ) and defined in project documents that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

6 QUALITY ASSURANCE

- a. The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in accordance with all applicable standards below:
 - 1. CSA C22.2, No. 14-M91 Industrial Control Equipment.
 - 2. CSA C22.2, No. 100 Motors and Generators
 - 3. CSA 282-15
 - 4. EN 61000-6
 - 5. EN 55011
 - 6. FCC Part 15 Subpart B
 - 7. ISO 8528
 - 8. IEC 61000
 - 9. UL 508
 - 10. UL 2200
 - 11. UL 142
 - 12. UL 6200
 - 13. Designed to allow for installed compliance to NFPA 37, NFPA 70, NFPA 99 and NFPA 110
- b. Manufacturer Qualifications:
 - 1. Current certificate holder for ISO 9001 compliance.
 - 2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 25 years and who maintains a service organization of factory-authorized generator technicians available twenty-four hours a day throughout the year.
 - 3. Manufacturing and assembly of products must be done in the United States using domestically sourced materials to the extent practical.
- c. Installer Qualifications: An authorized representative who is trained and certified by the manufacturer on stationary power systems.

7 WARRANTY

- a. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty: 5 Year Comprehensive from date of Substantial Completion.
 - 2. A Comprehensive Warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for covered warranty repairs during the listed warranty period. A Limited warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for the first 2 years and then replacement parts for the remainder of the listed warranty period.

B.PRODUCTS

1 MANUFACTURERS

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Generac Power Systems, Inc.; 80 kW T, 4.5L (Turbo) with a K0080124Y21 - 80kW alternator. The Three Phase generator shall be rated for 80 kW at 208 volts and 60 Hz, at 0.8 power factor lagging while operating at a maximum ambient temperature of 77 Fahrenheit and maximum altitude of 3500 feet above sea level without reduction in electrical output capacity. Comparable products by one of the following will be considered:
 1. Generac, Inc.
 2. Caterpillar, Inc.
 3. Cummins Power Generation.
- b. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer. "Source Limitations: Obtain packaged engine generators and auxiliary components from single supplier. The equipment supplied and installed shall meet the requirements of NEC and all applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory certified service personnel.
- c. Requests for substitutions shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data and a completed generator sizing model using the proposed manufacturer's generator sizing software shall accompany each request and authorized acceptance shall be addenda only. Should any substitutions be made, the contractor shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2 PERFORMANCE REQUIREMENTS

- a. NFPA Compliance:
 1. Comply with NFPA 37.
 2. Comply with NFPA 70.
 3. Comply with NFPA 99.
 4. Comply with NFPA 110 requirements for Level 1 EPSS.
- b. UL Compliance: Engine generator assembly and factory enclosure (if provided) shall be UL 2200 listed.
- c. Engine Exhaust Emissions: Comply with applicable US EPA, State and Local Government requirements. Spark-ignited Stationary Emergency: Engines shall be certified by the manufacturer to comply with 40 CFR Part 60 Subpart JJJJ, Table 1, Emission Standards for Stationary Emergency SI Engines and Table 2, Requirements for Performance Tests.

3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- a. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- c. Power Rating: Standby.

- d. Service Load: The generator set shall be a Generac model 80 kW T, 4.5L (Turbo) with a K0080124Y21 - 80kW alternator. It shall provide 80 kW and 100 kVA while operating at the maximum ambient operating temperature and elevation specified in the project documents.
- e. Power Factor: 0.8 lagging.
- f. Frequency: 60 Hz.
- g. Voltage: 208 Volts ac.
- h. Phase: Three Phase, Three Wire.
- i. Induction Method: Naturally aspirated or Turbocharged.
- j. Governor: Adjustable isochronous, with speed sensing.
- k. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
- l. Nameplates: For each major system component to identify manufacturer's name, model and serial number of component.
- m. Engine Generator Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 14.58 percent variation for 50 percent step-load increase or decrease at unity power factor. Voltage shall recover and remain within the steady-state operating band within three seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Less than 5.0 Hertz variation for 50 percent step-load increase or decrease at unity power factor. Frequency shall recover and remain within the steady-state operating band within five seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined in accordance with NEMA MG 1, shall not exceed 50 percent.
 - 7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 - 8. Start time to comply with NFPA system requirements.

4 ENGINE PERFORMANCE

- a. Fuel: Natural gas shall be "pipeline grade" meeting the following conditions:
 - 1. Methane number 80 or greater.
 - 2. High heating value shall be within the range of 950 - 1,150 BTU/scf.
 - 3. Hydrogen sulfide shall not exceed 0.3 g/100 scf.

4. Total sulfur shall not exceed 20 g/100 scf.
 5. Water vapor content shall not exceed 0.32 g/100 scf.
- b. Rated Engine Speed: 1800 rpm.
- c. Lubrication System to be engine mounted.
1. Oil filter shall be engine-mounted replaceable cartridge type with integral bypass valve, in accordance with manufacturer recommendations.
 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- d. Jacket Coolant Heater: Jacket water heater shall be sized per NFPA110 and UL listed to ensure that genset will start within the specified time period and ambient conditions.
- e. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gauge glass and petcock.
 3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 4. Maximum Ambient Operating Temperature on Radiator: 104 degrees F (40 degrees C).
 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
 - b. Meets SAE 100R1A Type S, EN853 1SN, ISO 1436-1 Type 1SN
 - c. Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- f. Muffler/Silencer:
1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
- g. Air-Intake Filter: Heavy duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- h. Starting System: 12 or 24-V electric, with negative ground.
1. Cranking Cycle: As required by NFPA 110 for system level specified.
 2. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle as required by NFPA 110 for system level specified.
 3. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 minimum continuous rating.
 4. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and NFPA 110 Section 5.6.4.6 for Level 1 systems.:

5 FUEL SYSTEM – NATURAL GAS

- a. Comply with NFPA 37.
- b. Operating Pressure: 5 inches of water column.
- c. Flowrate: Maximum gas flow demand at 100% load: 1063 cubic feet per hour.

6 CONTROL AND MONITORING

- a. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- b. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- c. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.
- d. Control panel must comply with UL 6200. The controller shall meet ASTM B117 (salt spray test).
- e. Connection to Building Management: Provide connections for data transmission of indications to remote data terminals via BACnet MS/TP.
- f. Environmentally Hardened Design: Open circuit boards, edge cards, and PC ribbon cable connections are unacceptable.
- g. PCB Construction: Circuit boards with surface-mounted components to provide vibration durability. Circuit boards utilizing large capacitors or heat sinks must utilize encapsulation methods to securely support these components.
- h. Configuration:
 - 1. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel powered from the engine generator battery.
- i. Control and Monitoring Panel:
 - 1. Digital engine generator controller with integrated touch screen, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
 - 2. Instruments: Located on the control and monitoring panel and viewable during operation.
 - a. Engine lubricating-oil pressure gauge.
 - b. Engine-coolant temperature gauge.

- c. DC voltmeter (alternator battery charging).
 - d. Running-time meter.
 - e. AC voltmeter, for each phase.
 - f. AC ammeter, for each phase.
 - g. AC frequency meter.
 - h. Generator-voltage adjusting feature.
3. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
- a. Cranking control equipment.
 - b. Run-Off-Auto switch.
 - c. Control switch not in automatic position alarm.
 - d. Overcrank alarm.
 - e. Overcrank shutdown device.
 - f. Low-water temperature alarm.
 - g. High engine temperature pre-alarm.
 - h. High engine temperature.
 - i. High engine temperature shutdown device.
 - j. Overspeed alarm.
 - k. Overspeed shutdown device.
 - l. Low fuel main tank.
- 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required for the indicated EPSS class.
- m. Coolant low-level alarm.
 - n. Coolant low-level shutdown device.
 - o. Coolant high-temperature prealarm.
 - p. Coolant high-temperature alarm.
 - q. Coolant low-temperature alarm.
 - r. Coolant high-temperature shutdown device.
 - s. EPS load indicator.
 - t. Battery high-voltage alarm.
 - u. Low cranking voltage alarm.
 - v. Battery-charger malfunction alarm.
 - w. Battery low-voltage alarm.
 - x. Lamp test.
 - y. Contacts for local and remote common alarm.
 - z. Remote manual stop shutdown device.
 - aa. Total engine run hours, non-resettable.
 - bb. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.
- j. External Alarm & Status Relays: Provide a separate terminal block, factory wired to Form C dry contacts, for each alarm and status condition required by Building Management or other external systems as shown on electrical drawings.
- k. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.
- l. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing

switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
 2. Low water-temperature alarm.
 3. High engine temperature pre-alarm.
 4. High engine temperature alarm.
 5. Low lube oil pressure alarm.
 6. Overspeed alarm.
 7. Low fuel main tank alarm.
 8. Low coolant level alarm.
 9. Low cranking voltage alarm.
 10. Contacts for local and remote common alarm.
 11. Audible-alarm silencing switch.
 12. Air shutdown damper when used.
 13. Run-Off-Auto switch.
 14. Control switch not in automatic position alarm.
 15. Fuel tank derangement alarm.
 16. Fuel tank high-level shutdown of fuel supply alarm.
 17. Lamp test.
 18. Low-cranking voltage alarm.
 19. Generator overcurrent-protective-device not-closed alarm.
- m. Remote Emergency-Stop Switch: Provide remote emergency stop switch in quantity and style as shown on electrical drawings. Electrical contractor to coordinate exact location with engineer and local AHJ.
- n. Engine Run Relay: The generator set shall be provided with a run relay which shall provide a double-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)
- o. Data Logging:
1. Event Logging – the controller keeps a record of up to 8,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a USB storage device or onto a PC through the service program.
 2. Event Snapshot – the control system shall capture 15 seconds of critical data around the time a fault or warning. This data shall be viewable on the controller and downloadable.
 3. Data Logging – the controller shall allow customized parameters to be logged based on a start trigger from the controller interface.
 - a. The parameters are selectable from all monitored parameters.
 - b. The sample period shall be configurable from 1 second to 1 day.
 - c. The collected data shall be stored on a USB storage device plugged into the control panel.

7 GENERATOR OVERCURRENT AND FAULT PROTECTION

- a. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
 2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
 - b. Generator Overcurrent Protective Device:
 1. Unit mounted circuit breakers. Rating, ampacity, accessories, as shown on drawings or as listed below:
 2. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:
 - a. Tripping Characteristic: Designed specifically for generator protection.
 - b. Trip Rating: Matched to generator output rating.
 - c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
 - d. Mounting: Adjacent to, or integrated with, control and monitoring panel.
 - c. Generator Controller Integrated Alternator Protective Functions:
 1. Short-time I^2t function : Generator controller-based function shall continuously monitor current level in each phase of alternator output, integrate alternator heating effect over time, and predict when thermal damage of alternator will occur. As overcurrent heating effect on the alternator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits.
 2. Long-time function: Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
 3. Short-circuit fault clearing: Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- 8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR
- a. Comply with NEMA MG 1.
 - b. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
 - c. Electrical Insulation: Class H.
 - d. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
 - e. Range: Provide range of output voltage by adjusting the excitation level.

- f. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity. Stator shall be skewed construction to minimize harmonic voltage distortion.
- g. Enclosure: Drip proof.
- h. Instrument Transformers: Mounted within generator enclosure.
- i. Voltage Regulator:
 - 1. Voltage Regulator: Solid-state type, separate from exciter. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain steady-state generator output voltage within $\pm 0.25\%$ for any constant load between no load and full load. The regulator shall be capable of sensing true RMS. The regulator shall provide an adjustable Volts/Hz slope regulation characteristic in order to optimize voltage and frequency response for site conditions.
 - 2. Alternator Excitation: Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
 - 3. The generator must accept rated load in one-step.
 - 4. System Transient Voltage Performance: Alternator shall be capable of supplying 141 sKVA with a voltage dip not more than 35% at 0.3 starting power factor. Sustained voltage dip data or manufacturer-published SKVA numbers based on unity PF alternator-only dynamometer testing will not be accepted.
- j. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point. The strip heater shall be wired directly to the incoming power distribution panel or load center.
- k. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- l. Tropical Coating: An additional coating of resin shall be applied to the alternator to protect in high humidity or tropical climates. Resin shall be an anti-fungal coating, protecting the alternator.

9 OUTDOOR ENGINE GENERATOR ENCLOSURE

- a. Basis of design is a Sound Level 2.
- b. Generator packaged within manufacturer's weather protective, sound attenuated enclosure. Enclosure and generator set shall be UL 2200 Listed as a system.
- c. Enclosure Construction: Minimum 14 gauge construction. Roof construction shall be raised-seam, gasket-free interlocking panels. Rivets shall not be used on external painted surfaces. Design shall be rodent resistant.
- d. Doors shall be equipped with lift-off pin and sleeve type hinges to allow access to the engine, alternator, and control panel. Hinges shall be adjustable for door alignment. Hinges and all exposed fasteners shall be stainless steel. Each door shall be equipped with minimum 2-point latching mechanism and identical keys. Perimeter of all door openings shall include polyethylene gasket.
- e. Upward discharging exhaust hood for engine cooling airflow and exhaust.
- f. Engine exhaust silencer mounted within enclosure discharge hood.

- g. Enclosure Finish: Electrostatic applied powered paint, baked and finished to manufacturer's specifications. Finish system shall be subjected to the following tests:
 - 1. ASTM D1186 - 87; 2.5+ mil Paint Thickness
 - 2. ASTM D3363 - 92a; Material Hardness
 - 3. ASTM D522 - B; Resistance to Cracking
 - 4. ASTM D3359 - B; Adhesion
 - 5. ASTM B117 D 1654; Resistant to Salt Water Corrosion
 - 6. ASTM D1735 D 1654; Resistant to Humidity
 - 7. ASTM 2794 93 (2004); Impact Resistance
 - 8. SAE J1690 - UV Protection"
- h. Enclosure Color: Manufacturer's standard color, or custom color matched based on architect's design with color sample provided to generator manufacturer.
- i. Wind Rating: Enclosure shall be constructed to attain basic wind speed rating of 110 MPH; WIF 1.15, Exposure Category "C", Building Classification "Enclosed", Topographic Factor Kzt = 1. Wind Design Pressures: windward, 20.6 lb/ft²; leeward, -12.9 lb/ft²; roof, -18.0 lb/ft²."
- j. Snow Load Rating: Minimum 70 pounds per square foot.
- k. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.
- l. Sound Insulation: Enclosure and air discharge hood completely lined with reflective silver mylar faced sound attenuating closed cell foam that meets UL 94 HF1 standards for flammability (FMVSS 302 test method). Roof sound insulation panels shall include additional mechanical retention.
- m. Sound Performance: The engine generator, while operating at full rated load, shall not exceed 65.00 dBA average measured at 23 ft (7 meters) from the engine generator in a free field environment.
- n. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.
- o. Convenience Outlet: Factory-wired convenience 120v duplex-outlet within enclosure, GFCI.
- p. Rodent Guard: Provide a gland plate to prevent rodents and other varmints from entering generator enclosure and ensure proper air circulation of combustion and cooling air.
 - 1. The guard must be rust-resistant and durable enough to withstand exposure to the elements.
 - 2. Guard must not interfere with the generator's normal operation and be easy to install or remove.
 - 3. The material of the guard should not interfere with the generator's cooling system or ventilation.
 - 4. The guard must not require maintenance or replacement regularly.

10 VIBRATION ISOLATION DEVICES

- a. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
 - 1. Material: Standard neoprene separated by steel shims.
- b. Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
 - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of 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. Minimum Deflection: 0.5.
- c. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

11 SOURCE QUALITY CONTROL

- a. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- b. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Test generator, exciter, and voltage regulator as a unit.
 - 3. Full load run.
 - 4. Maximum power.
 - 5. Voltage regulation.
 - 6. Transient and steady-state governing.
 - 7. Single-step load pickup.
 - 8. Safety shutdowns.
 - 9. Report factory test results within 10 days of completion of test.

12 FINISHES

- a. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

C.EXECUTION

1 EXAMINATION

- a. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- b. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.

2 PREPARATION

- a. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service in accordance with requirements indicated:
 1. Notify Project Manager in advance of proposed interruption of electrical service.
 2. Do not proceed with interruption of electrical service without written permission.

3 INSTALLATION

- a. Comply with NECA 1 and NECA 404.
- b. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- c. Equipment Mounting:
 1. Install packaged engine generators on cast-in-place concrete equipment bases or steel dunnage as indicated on drawings.
 2. Coordinate size and location of mounting bases for packaged engine generators.
 3. Install unit with vibration isolation devices described in section 2.11.

4 FIELD QUALITY CONTROL

- a. Tests and Inspections: The supplier of the electric generating plant and associated items covered herein shall provide factory certified technicians to inspect the completed installation and to perform an initial startup inspection to include:
 1. Ensuring the engine starts (both hot and cold) within the specified time.
 2. Verification of engine parameters within specification.
 3. Verify no load frequency and voltage, adjusting if required.
 4. Test all automatic shutdowns of the engine-generator.
 5. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.
- b. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

- c. Battery and Charger Tests:
 - 1. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions.
 - 2. Verify that measurements are within manufacturer's specifications."
- d. System Integrity Tests: Verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- e. Coordinate tests with tests for transfer switches and run them concurrently.
- f. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- g. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- h. Remove and replace malfunctioning units and retest and reinspect as specified above.
- i. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- j. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations.

5 DEMONSTRATION

- a. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

6 MAINTENANCE SERVICE

- a. Repair Service Capabilities:
 - 1. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including: engines, alternators, control systems, paralleling electronics, and power transfer equipment.
 - 2. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 50 miles of the site.
 - 3. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.
- b. Preventative Maintenance Service Agreement: The supplier shall include as a line item adder in the proposal, a one-year maintenance service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine generator set(s)

and the transfer switch(es). This agreement shall include semi-annual preventative maintenance visits to verify operation and/or complete the following:

1. All periodic engine maintenance as recommended by the service manual.
2. All electrical controls maintenance and calibrations as recommended by the manufacturer.
3. All auxiliary equipment as a part of the emergency systems.
4. The supplier shall guarantee emergency service.
5. All expendable maintenance items are to be included in this agreement.
6. A copy of this agreement and a schedule shall be provided in the submittal documents, detailing scope of work and preventative maintenance service visit interval.

END OF SECTION 263213

SECTION 26 33 05 – BATTERY EMERGENCY POWER SUPPLY (EI1)

1.1 SPECIFICATION

This specification defines the electrical and mechanical characteristics and requirements for a line interactive, single-phase, solid-state uninterruptible power supply, and hereafter referred to as the UPS system. The UPS shall provide high quality, computer grade AC power for today's electronic lighting loads (power factor corrected and self-ballast fluorescent, incandescent, quartz re-strike, halogen, LED and HID) during emergency backup.

The UPS shall incorporate a high frequency pulse width modulated (PWM) sine wave inverter utilizing IGBT technology, a microprocessor-controlled inverter and a temperature compensating battery charger, communication port, and a user-friendly control panel with audible and visual alarms.

1.2 DESIGN STANDARDS

The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall supersede.

- UL 924 Standard Emergency Lighting and Power Equipment
- UL 924A Auxiliary Lighting
- National Electrical Code
- NFPA-101 (Life Safety Code)
- NFPA-111 (SEPSS)
- OSHA

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements - Electronics Module

A. Nominal input/output Voltage

The Input and Output voltage of the UPS shall be pre-configured to match the user specified input and load requirements. Available voltages are 120, 208, 240, 277 or 480 VAC.

Input: 277 VAC, 1-phase, 2-wire-plus-ground

Output: 277 VAC, 1-phase, 2-wire-plus-ground

B. Output Load Capacity

The output load capacity of the UPS shall be rated in kVA at unity power factor. The UPS shall be able to supply the rated kW from .5 lagging to .5 leading.

Rating: 1.6 kVA / kW

1.3.2 Design Requirement - Battery System

A. Battery Cells

The UPS shall be provided with sealed, valve regulated, lead acid batteries.

B. Reserve Time

The battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a mains failure.

Battery Reserve time: Minimum 90 minutes

C. Recharge Time

The battery charger shall recharge the fully discharged batteries within a 24-hour period. The charger shall be an integrated two-step, microprocessor controlled and temperature compensating.

1.3.2 Design Requirement - Transformer Module

For systems with mixed input voltages the use of an isolation and / or autotransformer may be required. The transformer(s) is not bypassed when optional maintenance bypass circuit is activated.

1.3.3 Modes of Operation

The UPS shall be designed to operate with less than a 2-millisecond transfer time:

A. Normal

The UPS Inverter is a line interactive standby system and the commercial AC power continuously supplies the critical load. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies to the inverter while simultaneously providing floating charge to the batteries.

B. Emergency

Upon failure of the commercial AC power the inverter instantaneously with a maximum of a 2-millisecond break, switches its power supply from the input converter to the battery system. There shall be no loss of power to the critical load upon the failure or restoration of the utility source.

C. Recharge

Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

1.3.4 Performance Requirements

1.3.4.1 AC Input to UPS

A. Voltage Configuration for Standard Units: 1-phase, 2-wire-plus-ground.

B. Voltage Range: (+10%, -10%)

C. Frequency: 60 Hz (+/- 3%)

D. Short Circuit Rating: UL Listed for 65kAIC, RMS symmetrical

E. Power Factor: . 5 lagging / leading

F. Inrush Current: 1.25 times nominal input current, 10 times 1 line cycle for incandescent loads

G. Current Limit: 125% of nominal input current

H. Current Distortion: 10% THD maximum from 50% to full load

I. Surge Protection: Sustains input surges without damage per standards set in UL924

1.3.4.2 AC Output, UPS Inverter

- A. Voltage Configuration for Standard Units: 1-phase, 2-wire-plus-ground
- B. Static Voltage Stability: Load current changes +/- 2%, battery discharge +/- 12.5%
- C. Dynamic Voltage Stability: +/- 2% (25% step load), +/- 3% (50% step load)
- D. Dynamic Recovery Time to within 1% of nominal: 3 cycles (0-100% load step)
- E. Output Harmonic Distortion: < 3% (with linear load)
- F. Frequency: 60 Hz (+/- .05Hz during emergency mode)
- G. Load Power Factor Range: 0.5 lagging to 0.5 leading
- H. Output Power Rating: 1.6 kVA = kW
- I. Overload Capability: to 100% continuous rating
to 115% for 10 minutes
to 150% for 16 line cycles
- J. Crest Factor: <= 3.8
- K. Efficiency 97 - 98%

1.4 ENVIRONMENTAL CONDITIONS

The UPS shall be capable of operating within the specified design and performance criteria provided that the following environmental conditions are met:

- A. Storage/Transport Temperature:
 - 4 to 158 deg. F (-20 to 70 deg. C) without batteries
 - 0 to 104 deg. F (-18 to 40 deg. C) with batteries*
 - Maximum recommended storage temperature for batteries is 77 deg. F for up to six months. Storage at up to 104 deg. F is acceptable for a maximum of three months.
- B. Operating Temperatures: 32° to 104° F (0° to 40° C); UL rating 68° to 86° F (20° to 30° C).
- C. Relative Humidity: 0 to 95% non-condensing:
- D. Audible Noise: 45 dBA @ 1 meter from surface of the UPS
During Normal Mode

1.5 SUBMITTALS

1.5.1 Proposal Submittals

Submittals with the proposal shall include the following:

- A. System configuration with single-line diagrams
- B. Functional relationship of equipment including weights dimensions and heat Dissipation

C. Descriptions of equipment to be furnished, including deviations from these specifications

D. Size and weight of units to be handled by installing contractor

1.5.2 UPS Delivery Submittals

Submittals upon UPS delivery shall include:

- A. A complete set of submittal drawings
- B. One set of instruction manuals. Manuals shall include a functional description of the equipment, installation, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.6 WARRANTY

1.6.1 UPS Module

The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship date, whichever occurs first. The standard warranty will be increased to 2 years with the purchase of a factory start-up.

1.6.2 Battery

The battery manufacturer's standard warranty shall be passed through to the end user. Sealed Lead Calcium VRLA, 10-year life expectancy – one-year full replacement warranty plus an additional nine years pro-rata.

1.7 QUALITY ASSURANCE

1.7.1 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

SECTION 2.0 PRODUCT

2.1 FABRICATION

All materials of the UPS shall be new, of current manufacture, high grade, free from all defects and shall not have been in prior service except as required during factory testing.

The UPS module and batteries shall be housed in a single freestanding NEMA type 1 enclosure. Front access only shall be required for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service.

The UPS shall be powder painted with the manufacturer's standard color. The UPS shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

Cooling of the UPS shall be forced-air in emergency mode with internally mounted fans to minimize audible noise. Fans shall not operate in the standby mode. The UPS shall provide fan power. No air filters shall be required.

2.2 COMPONENTS

The UPS shall be comprised of the following components:

- A. UPS Module - The UPS module shall contain an inverter, an AC distribution module with an input circuit breaker, back-feed relay, control, and monitoring subsystems.

- B. Battery Module** - The battery module shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions. The 90 - minute battery module shall be contained in same cabinet as electronics regardless of the system VA.

2.2.1 Battery Charger

A. General

In the standard configuration the charger converts ac voltage to dc voltage. With commercial power present, the inverter power transformer is powered and the IGBT modules are microprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit supplies constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at maximum level. Recharge time is 24 hours maximum at nominal ac input voltage. The ac ripple current of the dc output meets the battery manufacturer specification, thus ensuring the maximum battery lifetime.

B. AC Input Current

The charger unit is provided with an ac input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.

C. Automatic Restart

Upon restoration of utility AC power, after a utility AC power outage and after a full UPS automatic end-of-discharge shutdown, the UPS will automatically restart, performing the normal UPS start up.

D. DC Filter

The charger shall have an output filter to minimize AC ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS.

E. Battery Recharge

The charger is capable of producing battery-charging current sufficient enough to recharge the fully discharge battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

F. Over-voltage Protection

The charger is equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger shuts down automatically and initiates an alarm condition.

2.2.2 Inverter

A. General

The inverter converts dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment. The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capacitors, ensure a very low distortion of the output voltage (THD<3% on linear loads).

B. Overload Capability

The inverter during emergency modes shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current for 16 line cycles, 115% for 10 minutes.

C. Output Power Transformer

A dry type power transformer provides the inverter AC output. The transformer is built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.

2.2.3 Display and Controls

A. Monitoring and Control

The UPS system provides operation monitoring and control, audible alarms, and diagnostics. The front-mounted control panel includes a 4-line by 20-character OLED display and a keypad for user interface. The display will be menu driven. The system will have a continuous scrolling display of the following: Date & time, System Status (AC Status, Battery Status, Charger Status) and any system faults: This allows the operator to easily “watch” system functions as they occur and check on virtually any aspect of the system’s operation. Monitoring and control are microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system is multi-level password protected for all control functions and parameter changes.

B. Metering

Scrolling through the meter functions can monitor the following measurements:

- Utility input voltage
- System output voltage
- Battery voltage
- Battery current
- System output current
- System output VA
- Inverter wattage
- System temperature
- Date & time
- System Days

C. Audible Alarm

Audible alarm will activate with any of the following conditions and automatically store the 75 most recent events.

- High battery charger voltage
- Charger Fault
- High AC input voltage
- Low AC input voltage
- Near low battery voltage
- Low battery voltage
- Load reduction fault
- High Ambient temperature
- Inverter fault
- Output fault
- Output overload
- Output overload shutdown
- System test failure

2.2.4 Communication Interfaces

2.2.4.1 BACnet MS/TP Interface

The system shall be equipped with an RS-485 serial port for remote communications to a Building Management System (BMS) via BACnet MS/TP protocol. The BACnet interface shall support standard baud rates (9600, 19200, 38400, 57600, 115200) and MAC addressing (0-127), and have a programmable systemwide Device Instance number. The BACnet interface shall support standard BACnet discovery. The BACnet interface shall provide read-only access to the following inverter telemetry:

- Input Voltage(s)
- Output Voltage(s)
- Output Current(s)
- Total Output Power
- Ambient Temperature
- Battery Voltage
- Battery Current
- Total Time On Battery
- Days of Operation
- The results of the inverter's last auto-run monthly self-test
- The results of the inverter's last auto-run yearly self-test
- Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, 'load reduction' activated, ambient temperature high, and battery charger fault).
- Event logs, Alarm logs and Test logs, as text files downloadable via BACnet file transfer

2.2.5 Manual and Programmable Testing

The system shall incorporate a manual test function and two automatic test modes. The system will perform a programmable, self-diagnostic monthly test for 5 minutes, which is preset, for the 15th of every month and the user can program the event day and time. The yearly self-diagnostic test is for 90 minutes and the user can program the day and time the event is to take place. The microprocessor automatically records the last 75 test events in its own separate test result log.

2.2.6 Battery Assembly

The batteries are a sealed, lead-acid valve regulated battery cells with a one-year full, nine year prorated warranty. Batteries shall be interconnected via cables and will be provided with shelf interconnects where required. A disconnect means shall be included for isolation of battery assembly from the UPS module.

2.2.7 System Options

- Output Circuit Breakers:
Distribution circuit breakers are for output load protection - Protection for the normally on and/or for the optional normally off loads. A maximum of 10 unsupervised 1-pole and a maximum of 6 supervised 1-pole circuit breakers are available. All circuit breakers are rated for 18,000 AIC @277VAC.
- Output Circuit Breaker Trip Alarm:
An audible and visual alarm activates when an output distribution circuit breaker is open or has tripped.
- Summary Form "C" Contacts:
Form "C" contacts rated at 5 amps maximum at 250VAC/30VDC. Dry contacts will change state when any system alarm activates. Contacts change states with the following alarms: High battery charger fault, near low battery, low battery, load reduction fault, output overload, high/low AC input volts, high ambient temperature, inverter fault, and with optional circuit breaker trip alarm.
- Maintenance Bypass Switch:

This device is internally mounted in the system and permits maintenance personnel to easily bypass the protected equipment directly to the AC utility power. The make before break switch isolates the system to perform routine maintenance or servicing.

- Status Monitoring Contacts:
Form “C” dry contacts capable of monitoring system and option statuses (Inverter On, Inverter Off, AC Present, High Temperature, Summary Alarm, System Bypass* and OTA*)
*Requires purchase of Maintenance Bypass and/or Output Trip Alarm options.
- Seismic Mounting:
Additional base to provide for seismic mounting increases system height by 4”
- BACnet MS/TP:
Allows for communication of data from the inverter over RS-485 using BACnet MS/TP protocol. See Communication Interfaces specification.

2.2.8 Accessories

- Remote Summary Alarm Panel:
A 4” high by 4” wide by 2 1/4” deep box containing a red alarm light and buzzer with a silence switch will activate on any alarm condition.

SECTION 3.0 EXECUTION

3.1 WIRING

All wiring shall be installed in conduit. Input and output wiring shall enter the cabinet in separate conduits.

3.2 UNIT START-UP and SITE TESTING

Site start-up and testing shall be provided by the manufacturer’s field service representative during normal working hours (Mon. - Fri. 8 a.m. - 5 p.m.). Individual scheduling requirements can usually be met with 7 working days advance notice. Site testing shall consist of a complete test of the UPS and accessories by the UPS manufacturer in accordance with manufacturer’s standards. Manufacturer’s approved service representative must perform commissioning for two-year warranty to apply.

3.3 REPLACEMENT PARTS

Parts shall be available through Field Service Centers throughout the country. Recommended spare parts shall be fully stocked by local field service personnel with back up available from manufacturing location.

3.4 MAINTENANCE CONTRACTS

A complete offering of preventive and full-service maintenance contracts for both the UPS system and batteries shall be available. An extended warranty and preventive maintenance packages shall be available. Factory-trained service personnel shall perform warranty and preventive maintenance service. A five-year maintenance contract will include a unit start-up and site testing.

SECTION 26 36 23 – AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.01 Scope

Furnish and install automatic transfer switch(es) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Basis of design is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch, Open - In Phase Transfer, 200 A, 3 Pole 4 Wire 480V, Transfer Switch in a NEMA 3R Enclosure. Each automatic transfer shall consist of a mechanically held power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 Acceptable Manufacturers

Automatic transfer switches shall be Generac TX Series. Equal transfer switches by ASCO, Caterpillar, Cummins, or other approved equal.

1.03 Codes and Standards

The automatic transfer switches and accessories shall conform to the requirements of:

- A. UL 1008 - Standard for Automatic Transfer Switches
- B. NFPA 70 - National Electrical Code (2017 version and later for start circuit monitoring)
- C. NEC Articles 700, 701, 702, 708
- D. NFPA 99 – Health Care Facilities
- E. NFPA 110 – Emergency and Standby Power Systems
- F. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- G. NEMA Standards ICS10, MG1, MG250, ICS6, AB1
- H. ANSI C62.41
- I. International Standards Organization: ISO 8528, 9001.
- J. Where seismic rating and/or certification is required: IBC 2018, OSHPD

PART 2 PRODUCTS

2.01 Mechanically Held Transfer Switch

- A. The basis of design is the Generac TX Series Transfer switch that utilizes a knife blade mechanically latching design with maintenance free contacts. The transfer switch unit shall be electrically operated and mechanically held. The open transition switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency. The delayed transition switch shall be mechanically interlocked to ensure one of three possible positions, normal and emergency.
- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- D. A manual operating handle shall be provided for maintenance purposes.

- E. Designs utilizing components of or parts thereof which are not intended for continuous duty, repetitive switching, or transfer between two active power sources are not acceptable.
- F. Where neutral conductors must be switched, the ATS shall be provided with fully rated neutral transfer contacts.
- G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully rated AL-CU pressure connectors shall be provided.
- H. The switch shall be capable of the following methods of transfer: Open with In-Phase transition only, Time Delay in Neutral transition, or In-Phase transition with a default to Time Delay in Neutral.
- I. The transfer switch shall have a Seismic Certification to the requirements of the international Building Code of electrical equipment.

2.02 ATS Control with Integrated User Interface Panel

- A. The basis of design is the Generac TXC-100 Controller with Integrated User Interface Panel which is voltage agnostic for service purposes removing the need for technicians to carry and support control panels for every available voltage. Any manufacturers that provide a controller or control panel that does not meet this requirement should notify the consulting engineer before bidding.
- B. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
- C. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and include standard on-board serial communications capability.
- D. A user accessible USB port shall be provided to facilitate firmware updates, uploading of switch operational parameters, downloading of event history and switch operational statistics. This USB port shall be front accessible without opening the ATS door.
- E. The controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.1\text{Hz}$. Time delay settings shall be accurate to $\pm 0.5\%$ of the full-scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to $+ 70$ degrees C.
- F. The controller power supply shall be field-configurable to operate on 120V through 480V systems without the need for transformers.
- G. Control logic shall be backed up with a rechargeable, user-replaceable lithium-ion battery that shall also maintain control power for up to 60 minutes in the event no source power is available.
- H. The controller shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance.
- I. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 - 1. IEC 61000 – 4 – 3 Radiated RF Field Immunity
 - 2. IEC 61000 – 4 – 4 Electrical Fast Transient/Burst Immunity
 - 3. IEC 61000 – 4 – 5 Surge Immunity

4. IEC 61000 – 4 – 6 Conducted RF Immunity
5. IEC 61000 – 4 -11 Voltage Dips and Interruptions
6. EN 61000 – 6 - 2 Industrial Immunity Requirements EN 61000-6-4 - Radiated Emissions
7. EN 61000 – 6 - 4 Conducted Emissions
8. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.03 Enclosure

The basis of design is a Generac TX Series Non-Service Entrance Rated Transfer Switch in a NEMA 3R enclosure, with dimensions no larger than 31.7 Inches in Height, 21 Inches in Width, and 12 Inches In Depth. Larger enclosures than the basis of design will need to be approved by the Consulting Engineer to ensure there is enough wall space and appropriate clearance.

- A. Provide a temperature and humidity controlled anti-condensation heater for all NEMA 3R and 4X enclosed units. Heater shall be an available option on NEMA 1 enclosures, when called for on plans. Heater cover to indicate a hot surface.
- B. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.
- C. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

PART 3 OPERATIONS

3.01 Controller Display and Keypad

- A. A backlit four-line graphical LCD display and human interface shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the RS-485 communications port.
- B. All instructions and controller settings shall be easily accessible, readable, and accomplished without the use of codes, calculations, or instruction manuals.
- C. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.
- D. The following parameters shall only be adjustable only by authorized service personnel:
 1. Nominal line voltage and frequency
 2. Single or three phase sensing on normal
 3. Transfer operating mode configuration, (open transition, or delayed transition)

3.02 Voltage and Frequency Sensing

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip settings capabilities; values shown as percentage of nominal unless otherwise specified.

Voltage and Frequency Settings	Range	Default Value
Source 1 (Normal) is Genset	Yes or No	No
Source 1 Undervoltage Dropout	50-97%	85%
Source 1 Undervoltage Pickup	52-99%	90%
Source 1 Overvoltage Dropout	105-120%	110%
Source 1 Overvoltage Pickup	103-118%	105%
Source 1 Underfrequency Dropout	90-97%	90%
Source 1 Underfrequency Pickup	91-99%	95%
Source 1 Overfrequency Dropout	103-110%	105%
Source 1 Overfrequency Pickup	101-109%	102%
Source 1 Voltage Imbalance Drop	5-20%	5%
Source 1 Voltage Imbalance Pickup	3-18%	3%
Source 1 Warmup Time	0-1800s	3s
Source 1 Cooldown Time	0-1800s	1800s
Source 1 Minimum Run Time	300-1800s	1200s
Source 2 is Generator	Yes or No	Yes
Source 2 Undervoltage Dropout	50-97%	85%
Source 2 Undervoltage Pickup	52-99%	90%
Source 2 Overvoltage Dropout	105-120%	110%
Source 2 Overvoltage Pickup	103-118%	105%
Source 2 Underfrequency Dropout	90-97%	90%
Source 2 Underfrequency Pickup	91-99%	99%
Source 2 Overfrequency Dropout	103-110%	105%
Source 2 Overfrequency Pickup	101-109%	102%
Source 2 Voltage Imbalance Drop	5-20%	5%
Source 2 Voltage Imbalance Pickup	3-18%	3%
Source 2 Minimum Run Time	300-1800s	1200s

Source 2 Warmup Time	0-1800s	3s
Source 2 Cooldown Time	0-1800s	1800s
Phase Rotation Check	ABC, CBA, OFF	ABC
Supply Overvoltage	350 VAC	Fixed
Manual Return to Normal	Yes or No	
Time Delay Settings		
Transfer to Emergency	120s max	30s
Re-transfer to Normal	1,800s max	1,800s
Time Delay Neutral	120s max	30s
Engine Cool Down	300-1,800s	1,800s
Delayed Transition Time	120s max	120s
Elevator Signal	120s max	30s
In Phase Transfer	Yes or No	
In Phase Synchronization	Time 60-3600s	300s
Preferred Source	S1, S2	S1
Voltage Imbalance Enable	Yes or No	
Voltage Imbalance Timeout	10-30s max	20s

- B. Repetitive accuracy of all settings shall be within 1% at +25C.
- C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via RS-485 communications port access.
- D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency.
- E. The backlit graphical display shall have multiple language capability. Languages can be selected from the user interface.

3.03 Time Delays

- A. A Line Interrupt delay shall be provided to override momentary normal source outages, delay all transfer and engine starting signals; adjustable 0 to 120 seconds. It shall be possible to bypass the time delay from the controller user interface.
- B. An Engine Warm Up delay shall be provided for extended engine RPM stabilization where fast transfer to the emergency source is not required; adjustable 0 to 1,800 seconds. It shall be possible to bypass the time delay from the controller user interface.
- C. A Transfer to Emergency delay shall be provided for controlled sequencing of loads to the emergency source; adjustable from 0 to 120 seconds. It shall be possible to bypass the time delay from the controller user interface.

- D. A Retransfer to Normal delay shall be provided to ensure stability of the normal source, adjustable from 0 to 1,800 seconds. Time delay shall be automatically bypassed if the emergency source fails and normal source is acceptable.
- E. An Engine Minimum Runtime delay shall be provided to reduce nuisance starts when the normal source power is unstable but does not trigger a transfer to the emergency source, adjustable from 5 to 30 minutes. Operates in conjunction with Engine Cool Down delay.
- F. An Engine Cool Down delay shall be provided; adjustable 300 – 1,800 seconds.
- G. A Delayed Transition delay shall be provided to ensure sufficient time for motor voltage decay for transition between live sources; adjustable from 0 – 120 seconds.
- H. An Elevator Signal Before Transfer output signal shall be provided to drive an external relay for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 120 second delay in any of the following modes:
 - 1. Prior to transfer only.
 - 2. Prior to and after transfer.
 - 3. Normal to emergency only.
 - 4. Emergency to normal only.
 - 5. Normal to emergency and emergency to normal.
 - 6. All transfer conditions or only when both sources are available.
- I. For special applications (i.e., three sources), the option to select the Preferred Source.
- J. All adjustable time delays shall be field adjustable without the use of special tools or software.

Time Delay Summary Table:

Time Delay Description	Range	Default Value
Line Interrupt Delay	0 – 120 sec.	3 sec.
Engine Warm Up Delay	0 – 1,800 sec.	3 sec.
Transfer to Emergency	0 – 120 sec.	3 sec.
Retransfer to Normal	0 – 1,800 sec.	1,800 sec.
Engine Minimum Run Time	5 – 30 min.	5 min.
Engine Cool Down	300 – 1,800 sec.	1,800 sec.
Delayed Transition (Center Off Position)	0 – 120 sec.	120 sec.
Elevator Signal Before Transfer	0 – 120 sec.	0 sec.
Preferred Source	Normal (S1), Emerg. (S2)	Normal (S1)

3.04 External Control Interfaces and Indicators

- A. Communications connectors, user interface and display shall be accessible and usable without presenting an arc-flash hazard.
- B. Customer inputs shall be optically isolated for wider compatibility with external systems. This will protect the controller from external surges and transient voltages.
- C. Surge Protection for the ATS controls shall be provided.
- D. Replaceable fuses to protect the power supply to the ATS control panel.
- E. A set of contacts rated 5 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output and run for the

duration of the Engine Minimum Runtime setting, regardless of whether the normal source restores before the load is transferred.

- F. Engine starting contacts shall facilitate start-circuit monitoring to comply with the 2017 and later versions of NFPA 70 Article 700.10 (D)(3).
- G. Two sets of Form-C auxiliary contacts rated 10 amps, 250 VAC shall be provided to indicate the switch actuator position, including center-off for Time Delay Neutral switches or a Permissive (Emergency Inhibit) condition.
- H. A single General Alarm (summary alarm) indication shall light up the alert indicator and de-energize the configured common alarm output relay for external monitoring.
- I. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source and one to indicate when the ATS is connected to the emergency source.
- J. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency source, as determined by the voltage sensing trip and reset settings for each source.
- K. LED indicating light shall be provided to indicate switch not in automatic mode (manual).
- L. LED indicating light shall be provided to indicate any alarm condition.
- M. The controller shall have two programmable inputs and one programmable output as standard; with an optional expansion board to add up to four programmable input/outputs. Programmable I/O conditions shall include:

Programmable Output	Programmable Input
Source 1 – Two Wire Start	Permissive (Emergency Inhibit)
Source 2 – Two Wire Start	Remote Engine Fast Test
Engine Exercising	Remote Engine Normal Test
Engine Warmup	ATS Timer
Signal Before Transfer	Initiate Demand Response
General Alarm	
Source 1 Good	
Source 2 Good	

- N. System Status - The controller LCD display shall include a System Status screen which shall be accessible from any point in the menu system by depressing the “ESC” key until you arrive at the System Status screen. This screen shall display a clear description of the active operating sequences and switch position. Operational status information displayed shall include:
 - 1. Source 1 status (good or bad)
 - 2. Source 2 status (good or bad)
 - 3. Any active timer
 - 4. Permissive (Emergency Inhibit when active)

3.05 Transfer and Exercise Controls

The following standard features shall be built into the controller, capable of being activated through keypad programming as required by the user:

- A. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.

- B. An engine generator exercising timer shall be provided to configure daily, day of week, weekly, bi-weekly, or monthly testing of an engine generator set at a specified time of day with or without load for a programmable period (Engine Minimum Runtime).
- C. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency for remote test. Test signal can be enabled through the keypad or digital input. Transfer to emergency for demand response can be enabled by digital input.
- D. For In-Phase Transfer Switch Designs: An in-phase monitor shall be provided in the controller such that the transfer occurs with less than ten degrees phase angle difference between sources. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents and shall not require external control of power sources. In-phase switch transfer time shall not exceed 25ms.
- E. For Delayed Transition Transfer Switch Designs: Terminals shall be provided for a remote contact to signal the ATS to load-shed (Permissive is removed) and move to a center-off position. When the load-shed signal is removed (Permissive is restored), the ATS shall reclose to the emergency. If normal source is good during load-shed the ATS shall transfer to and remain on normal source.

3.06 Data Logging and Diagnostics

Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual are not permissible.

- A. Controller & Contactor Health Monitoring with visual and auxiliary contact status shall be provided.
- B. Communications Interface – The controller shall be capable of interfacing, through a standard RS-485 serial communication port with a network of transfer switches.
- C. Data Logging – The controller shall have the ability to log data and to maintain the last 200 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
 - 1. Date, time and reason for transfer normal to emergency.
 - 2. Date, time and reason for transfer emergency to normal.
 - 3. Date, time and reason for engine start.
 - 4. Date and time engine stopped.
 - 5. Date and time emergency source available.
 - 6. Date and time emergency source not available.

PART 4 ADDITIONAL FEATURES AND ACCESSORIES

4.01 Additional Optional Features

- A. Line Interrupt Time Delay. - Not Selected
- B. Integrating Metering with current transformer. - Not Selected
- C. Manual Retransfer to Generator. - Not Selected
- D. Permissive (Emergency Inhibit). - Not Selected
- E. Chicago Toolkit. - Not Selected
- F. Expanded Input/Output Module. - Not Selected
- G. Pad lockable controller cover (Standard on NEMA 3R). Pad lockable user interface cover shall be provided with the ability to protect the user interface from the environment
- H. Temperature and Humidity Controlled Heater for NEMA 1. An enclosure heater strip shall be supplied inside the transfer switch enclosure and shall be controlled by an adjustable humidistat.

I. Transient Voltage Surge Suppressor (TVSS). - Not Selected

PART 5 ADDITIONAL REQUIREMENTS

5.01 Withstand and Closing Ratings

- A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. The basis of design for this project is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch with a 22ka 3 Cycle Rating, 22ka (.05 seconds) Time Based Rating, and a 35ka Specific Breaker Rating transfer switches from other manufacturers with ratings less than provided in this section will need to be approved by the Consulting Engineer to ensure compatibility with the project.
- B. Provide a temperature and humidity controlled anti-condensation heater for all NEMA 3R and 4X enclosed units. Heater shall be an available option on NEMA 1 enclosures, when called for on plans. Heater cover to indicate a hot surface.
- C. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.
- D. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

5.02 Tests and Certification

- A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.
- B. The ATS manufacturer shall be certified to ISO 9001: 2015 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation, and servicing in accordance with ISO 9001: 2015.

5.03 Service Representation

- A. The ATS manufacturer shall support a service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of switch shipments, by serial number, for a minimum of 10 years.

5.04 Warranty

- A. The basis of design is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch Comprehensive 5 Year Warranty.
- B. A Basic Warranty is defined as the manufacturer covering replacement parts for the listed amount of the warranty period.
- C. The Comprehensive Warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for covered warranty repairs during the listed warranty period.

- D. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.
- E. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

SECTION 26 51 00 – LIGHTING FIXTURES

A. GENERAL

1. The Contractor shall provide all fixtures and lamps where indicated on the Drawings.
2. Work shall include all stems, canopies and accessories necessary for a complete lighting fixture installation.
3. No PCB ballasts shall be accepted.
4. All lighting systems shall comply with the 2018 North Carolina State Energy Code and North Carolina Senate Bill 1946 and G.S. 143-64.17.

B. PRODUCT

1. Fixtures shall be as specified in the Fixture Schedule on the Drawings or approved equivalents.
2. All outdoor fixtures shall bear the approved third party test label for damp or wet locations as applicable. Where the ambient falls below 50°F that all fluorescent lamps and ballasts shall be rated for operation at 0°F.
3. Unless otherwise noted, all fixtures shall be new, free of defects and imperfections. Damaged fixtures shall be replaced at this Contractor's expense.
4. All acrylic lenses for lay-in troffers and wrap around fixtures shall have a nominal lens thickness of 0.125" unless noted otherwise on plans.
5. LED Luminaries:
 - a. LED driver manufacturers should have a minimum of five years of experience with the manufacture of LED drivers. All drivers shall have a minimum warranty of five years.
 - b. Where dimming is required, fixtures shall be dimmable down to 1% with standard 120/277 volt, electronic, low voltage dimmers.
 - c. Minimum color rendering index (CRI) shall be 80. Color temperature and performance shall conform to the parameters established by ENERGY STAR SSL standards (refer to ANSI-C78.377-2008).
 - d. Optical design shall be low glare, 50% cut-off.
 - e. Rated for 50,000 hours at 70% lumen maintenance.
 - f. LED driver shall be high efficiency with a minimum power factor of .90
 - g. 5 year, 100% warranty coverage for the driver, LED module, housing and trim. For the 1st year this shall be a complete parts and labor warranty. The 4th and 5th years shall cover parts only.

- h. Total harmonic distortion: $\leq 20\%$ (at full luminaire output and across specified voltage range)
- i. Transient and surge protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV for interior fixtures.
- j. Sound: Class A not to exceed a measured value of 24dB.
- k. Maximum standby power: 1W
- l. LED arrays in the product(s) will be considered defective in material or workmanship if a total of 10% or more of the individual light-emitting diodes in the product(s) fail to illuminate during normal operation after installation.

6. Emergency Exit Lights.

Emergency exit lights shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, Energy Code, NFPA-101, and NEMA Standards.

a. Battery

It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal.

b. Charger

It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

c. Additional Features

Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer rely.

d. Warranty

The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

e. LED

The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate

shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

f. Unit Test

Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. The battery test shall be done 10 days prior to final inspection by the AHJ. Any unit which fails the test must be repaired or replaced, and tested again. Copy of the test report shall be included with the project record documentation.

7. Emergency Lights.

Shall be completely self-contained, provided with maintenance-free 12 volt battery, automatic charger, two lamps and other features. Fixture shall be third party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, N.C. Building Code, UL 924, NC Energy Code, NFPA-101, and NEMA Standards.

a. Additional Features

Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay. If fluorescent emergency unit is used, a LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.

b. Battery

It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degrees C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and –negative terminal.

c. Charger

It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included in LEAD battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

d. Warranty

The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

e. Unit Test

Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. The battery test shall be done 10 days prior to final

inspection by the AHJ. Any unit which fails the test must be repaired or replaced, and tested again. Copy of the test report shall be included with the project record documentation.

8. Emergency Power Backup unit.

The unit is used for controlling designated light fixtures as shown on plan to be used as emergency light. The unit shall have rating as shown on plan. Unit shall be third party listed as emergency power backup unit for emergency light, and meet or exceed the following standards: NEC, N.C. Building Code, UL 924, NC Energy Code, NFPA-101, and NEMA Standards.

a. Battery

It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal.

b. Output characteristic.

It shall provide 60Hz sinusoidal waveform output and compatible with LED and fluorescent light fixtures. Transfer time shall be less than 1 second.

c. Warranty

The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contact document.

C. EXECUTION

1. All fixtures shall be installed in accordance with the National Electric Code.
2. All fixtures other than the lay-in type shall be individually supported from building structure with 1/4" threaded rods and nuts.
3. Where a recessed or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end to the building's structural system. The lay-in luminaire shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall be supported to the Building Structure as per the Ceiling Design Criteria, luminaire shall then be screwed to the main runners of the suspended ceiling track at all four (4) corners using sheet metal screws.
4. The complete emergency lighting system shall be tested by throwing the circuit breakers feeding the emergency lighting circuits. One and one-half hours thereafter, the battery voltages shall be recorded in a report to be submitted to the Engineer. This test shall be

performed just prior to final inspection, under witness of the AHJ as requested, and in accordance with NEC Articles 700.4 (A) and (D).

END OF SECTION 26 51 00

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 27 10 00 – TELECOMMUNICATION DISTRIBUTION SYSTEM

A. GENERAL

1. RELATED DOCUMENTS

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Specification Sections, apply to this Section.
- b. The Contractor shall provide the required protection in accordance with the requirements of these specifications and NEC 2020, Article 800. The protection shall be provided on both ends of all inter-building cables where required by code or otherwise indicated in the contract documents (i.e., building-to-building, building-to-modular classroom, or building-to-modular complex).

2. SUMMARY

- a. This Section includes a Telecommunications Distribution System which is ready for the installation of active electronic equipment such as hubs, routers, bridges, switches, repeaters, adapters, etc. The system shall incorporate all requirements of this specification.

3. CONTRACTOR DELIVERABLES

- a. The contractor will need to coordinate the installation of the telecommunications cabling with the general contractor. Cable shall not be installed until the building is secured.
- b. The Contractor shall prepare and provide two (2) copies of the following documentation for review and approval by the Engineer:
 - i) A labeled cable plant drawing.
 - ii) Work Area Floor Plans - Include detailed cable routes and labeling plan for all work areas. The Contractor may obtain floor plans from the Architect in AutoCAD format, if so desired, to aid in preparing the submittal.
- c. Upon completion of the project, the Contractor shall prepare "As-Built" documentation showing actual site conditions and installation as constructed and provide copies of such documentation as per paragraph A.3.b.
- d. In addition to the engineering diagrams, the following items shall be provided by the Contractor at substantial completion:
 - i) Laminated cable schedule; sized 8-1/2 "x 11".
 - ii) Record of field tests of System
 - The data TCO identification numbers in recording test results shall be the same as those shown on the "As-Built" and cable schedules.
- e. Technical Support Staff and Experience
 - i) The Contractor shall provide a list of its project management staff and technical support staff to be assigned to this project together with their resumes and working experience.

- ii) The Contractor shall utilize certified cable installers and technicians with approved vendor specific certification. The Contractor shall supply certification documentation for cable installers.
 - iii) The Contractor shall state their nearest branch office and dealer's office in relation to the proposed site of the cabling system. If none, the location of the main office shall be stated.
 - iv) The Contractor shall state their nearest location of their principal support center. This center shall have permanently stationed support staff that is capable of providing technical support if required.
- f. System Warranty
- i) The Contractor shall provide a five- (5) year warranty for both products and labor.
 - ii) Service must be provided within twenty-four (24) hours of notification for emergency situations and within seventy-two (72) hours for routine service.

4. PRODUCT SUBMITTALS

- a. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
 - i) Product data for system components

5. QUALITY ASSURANCE

- a. Comply as applicable with ANSI/TIA/EIA-568-B.1, ANSI/TIA/EIA-568-B.2, and ANSI/TIA/EIA-568-B.3 "Commercial Building Telecommunications Cabling Standard," most recent addition.
- b. Comply as applicable with ANSI/TIA/EIA-569-A, "Commercial Building Standards for Telecommunications Pathways and Spaces," most recent addition.
- c. Comply as applicable with ANSI/TIA/EIA-606, "The Administration Standard for Telecommunications Infrastructure of Commercial Buildings," most recent addition.
- d. Comply with NFPA 70, "National Electrical Code," 2020.
- e. NC STS-1000 Telecommunications Wiring Guidelines.
- f. "Nationally Recognized Testing Laboratory" (NRTL) Listing: Provide materials that are listed and labeled.
 - i) The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 - ii) Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
 - iii) FCC Regulations: Comply with FCC Part 68, Chapter 1, "US Code of Federal Regulations," Title 47 for all telephone system wire and cable connection components.

B. PRODUCTS

1. BACKBONE CABLE: Contractor shall provide all backbone cable inside building.
 - a. FIBER OPTIC CABLE
 - (1) All cables shall conform to or exceed the TIA/EIA-568-B.3 Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling Components Standard.
 - (2) The multi core optical fiber shall consist of multimode 50-micron fibers, OM4.
 - (3) The fiber cable shall meet the NEC requirements for OFN, OFNR or OFNP and comply with Bellcore, FDDI, TIA/EIA-568-B.3 and ICEA standards.
 - (4) Connectors shall be crimp-on type, pre-polished LC connectors or hot melt.
 - b. CATEGORY 3 COPPER VOICE
 - (1) Contractor shall supply unshielded 24 AWG solid conductor multi-pair copper cables as the backbone cables.
 - (2) The cable shall meet or exceed the TIA/EIA-568-B.2 "Commercial Building Telecommunications Cabling Standard" - Part 2: Balanced Twisted Pair Cabling Components.
 - (3) The PVC sheath shall have improved frictional properties, allowing it to be pulled through conduit without the use of lubricants.
 - (4) The cable shall be available in the form of twenty-five (25), fifty (50), one hundred (100), one hundred fifty (150), and two hundred (200) pairs.
2. HORIZONTAL CABLE: Contractor shall provide all horizontal cables.
 - a. CATEGORY CABLE (CAT6A)
 - (1) All cables shall conform to or exceed the TIA/EIA-568-C
 - (2) Other standards supported include IEEE 802.3, 10BASE-T, and ANSI X3T9.5 TP-PMD requirements for UTP at 100 Mbps.
 - (3) Cables shall be capable of supporting evolving high-end applications such as 1000 Mbps ATM. All cables shall be composed of 4-pair 23 AWG solid copper conductors.
 - (4) The cable shall be Underwriter's Laboratories Inc. (UL) listed type MPR, MPP, CMR, and CMP.
 - (5) Cable shall be plenum rated.
 - b. CATV COAXIAL: Horizontal CATV drop
 - (1) 75 OHM COAXIAL
 - (2) Cable shall be plenum rated.

3. TELECOMMUNICATIONS OUTLET (TCO)

- a. Shall be modular, RJ45 type/8 position/8 conductor.
- b. Shall be universal application/multivendor supportive accepting most phone and data plugs.
- c. Modular connectors shall be flush with outlet faceplate.
- d. Cover to match those indicated for power receptacle outlets in same spaces for materials and finish.
- e. Outlets shall be wired in an EIA/TIA 568B configuration.
- f. All outlets shall be listed for CAT6A application and utilize cross-over lead technology to address data circuit applications up to 100 MHz and conform to or exceed the EIA/TIA 568-C Commercial Building Telecommunications Wiring Standard and the following:

4. PATCH PANEL

a. FIBER OPTIC PATCH PANEL

- (1) The panel shall support shall be with LC connectors.

b. CAT6A PATCH PANEL

- (1) The panel shall support the Category 6A applications and facilitate cross-connection and inter-connection using patch cords.
- (2) The wiring blocks shall be fire-retardant, molded plastic consisting of horizontal index strips for terminating conductors. These index strips shall be marked with four colors on the high teeth, separating the tip and ring of each pair, to establish pair location.
- (3) The panel shall be able to accommodate over 500 repeated insertions without incurring permanent deformation and it shall pass the reliability test of no more than one contact failure in 10000 connections.
- (4) 19" rack mountable patch panels shall be used. Patch panel installations shall contain a retaining trough between every 100 pair termination block.
- (5) The panel shall be able to accommodate 23 AWG cable conductors.
- (6) The panel shall be Underwriter's Laboratories (UL) listed.
- (7) Shall be wired in an EIA/TIA 568B configuration.
- (8) All Category 6A patch panels shall support 100 Mbps TP-PMD and 155 Mbps ATM.

c. CATV PATCH PANEL

- (1) F TYPE connectors.

5. 19 INCH FREE STANDING RACK

- a. Hubbell HPW84RR19 or equal by Belden, APC, or Panduit.

- b. Provide 2 post cable management rack. The rack must provide a space on both sides for cable management.
 - (1) Front Horizontal wire management: Panduit CNMPHh2 or equal by Belden, APC, or Hubbell.
 - (2) Rear Horizontal wire management: Panduit WMPHF2E or equal by Belden, APC, or Hubbell.
 - (3) Wire management bracket: OCC VCM6 or equal by Beldin, APC, Panduit, or Hubbell.
 - c. Unit to be open steel configuration. Unit shall be heavy-duty construction and be mounted on floor.
 - d. Unit to be self-supporting.
 - e. Unit to be fully compatible with EIA 1 ¼" – ½" alternating hole patterns.
 - f. Provide clear finish over surface to inhibit oxidation.
 - g. Unit to be with two power strips. Power strip/surge with minimum of 15 ft. cord and LED ampere indicator. Power strip/surge protectors shall be delivered to the IT project manager.
6. CABLE TRAY:
- a. Cable tray shall be tubular stringer style Eaton B-LINE: SB-17 or equal by Panduit, Hubbell, APC, or Belden.
 - b. Width of tray shall be 12".
7. TERMINATION LABELS
- a. Shall conform to ANSI/TIA/EIA-606. Labels will have pressure sensitive, permanent acrylic type adhesive, P-Touch type weatherproof or equal.

C. EXECUTION

1. GENERAL REQUIREMENTS

- a. The Contractor shall maintain conductor polarity (tip and ring) identification at the MDF and station connecting blocks in accordance with industry practices.
- b. The Contractor shall provide all cables. All communication cables installed by the Contractor shall be fully tested in accordance with TIA-568-C series standard prior to acceptance.
- c. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, wiring duct (MDF & IDF locations), miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the System in a neat and orderly fashion as approved by the Engineer.
- d. It shall be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to properly complete the System. This may include, but is not limited to,

tools for terminating cables, testing, and splicing equipment for copper/fiber cables, communication devices, jack stands for cable reels, or cable winches.

- e. The Contractor shall be responsible for providing printed labels for all cables and cords to the specifications. No labels are to be written by hand including numbers on boots. Approval must be obtained from the engineer for labeling devices used.
- f. The Contractor shall not place or attach any telecommunications cabling alongside power lines, or share the same conduit, channel, or sleeve with electrical apparatus.
- g. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to all damage sustained to the cables by the Contractor during the implementation.
- h. The Contractor shall be responsible for providing an approved ground at all newly installed distribution frames and insuring proper bonding. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes and framework. All grounds and bonding shall consist of green #6 AWG solid copper wire and shall be supplied from an approved building ground and bonded to the main electrical ground.
- i. The Contractor shall furnish to the Owner all closeout documentation in a three-ring binder with proper labeling on cover and the end of the binder.

2. INSTALLATION, GENERAL

- a. Distribution System: The contractor is responsible for the back to the new communications closet.
- b. Raceway: Install service and distribution raceway for all cabling as indicated.
- c. Conduit sleeves for Computer Network Infrastructure shall be installed not more than four inches (4") from wall and shall be stubbed at a maximum of four inches (4") above or below finished floor. Plastic bushings and pull wires shall be provided.

3. HORIZONTAL CABLE INSTALLATION

- a. Obtain approval of all raceway system installation from engineer prior to installing any cable. Install cable without damaging conductors or jacket. Do not bend cable to a smaller radius than minimum recommended by manufacturer. Do not exceed manufacturers recommended pulling tensions. Pull cables simultaneously where more than one is being installed in the same raceway or at the same location. Use pulling compound or lubricant where necessary. The compound used must not damage conductor or insulation. Use pulling methods that will not damage cable or raceway, including fish tape, cable, rope, and wire-cable grips.
- b. Wiring Method
 - i) New Construction: Install outlet boxes at outlets. Install cable in raceway in wall. Terminate raceway with a bushing in ceiling space above nearest cable tray. Run cable in cable tray in accessible ceiling space.

- ii) Provide bushings on all conduits stubbed to ceiling void.
 - iii) Copper Cable above finished ceilings:
 - Splices: Do not splice cable between the normal terminations of runs.
 - c. The 4-pair UTP cables shall be installed using a star topology format from the administration subsystem on each floor to every individual TCO.
 - d. The length of any horizontal Cat 6A cable shall not exceed 295-ft (90 m).
 - e. Cabling in Telecommunications closets and Cabinets: Install conductors parallel to and at right angles to walls. Final Termination by contractor.
4. TELECOMMUNICATION OUTLET (TCO)
- a. Unless otherwise noted on the floor plans, the TCO shall be flush mounted.
 - b. Outlet jacks provided by contractor.
5. GROUNDING
- a. Communications Systems - In compliance with NEC 2020, Article 800.
 - i) See plan for detail.
 - b. Contractor shall install a copper busbar at the new telecommunication board for grounding of communication systems.
6. IDENTIFICATION
- a. Provide identification in accordance with the recommendations of ANSI/TIA/EIA-606-B, "Administration Standard for Telecommunications Infrastructure." Refer to labeling descriptions below.
 - b. New labeling shall be a fully integrated extension of the existing network labeling system. No duplication of the existing network nomenclature may be used in the new labeling system.
 - c. Buildings and Rooms
Building IDs and room numbers are assigned by the owner. The Designer and Contractor should check with the college project manager to ensure the proper building ID and room numbers are used when labeling communications systems components.
 - d. Racks
Racks in TRs shall be labeled based depending on their use. VoIP (1), Data (2), Security (3), and Miscellaneous (4). The label shall be machine generated, at least 1.5" high and have black letters on a white background. The label shall be plastic or vinyl and adhered to the center of the rack if possible.
 - e. Risers
All riser communications cabling such as Category 6a, Single Mode OS2 Fiber, Multi-mode 50 Micron OM3 Fiber, Multi-pair Category 3 telephone riser, and .500" Coax trunk shall be labeled on each end. This is to include originating and terminating Telecom room

information, individual fiber strand, telephone pair, and Cat 6a copper riser patch panel port information. Riser patch panel labeling shall be consecutive.

f. Fiber Optic Cabling and Systems

Fiber optic cables and segments have a long lifespan at the college and must conform to college labeling requirements to support identification and computerized management systems already in place.

(1) Fiber Cables

(1.1) Naming

A fiber cable is a jacketed set of fiber optic cables, themselves generally enclosed in buffer tubes. Fiber cables are routed between buildings on a campus and enclosed in fiber enclosures. These enclosures will be labeled to indicate where the fiber cable is terminated. Within each module of the enclosure individual fibers will be identified with a sequential index based on the color code.

(2) Patch Panels

(2.1) Naming

Patch panels are assigned an ID based on the room number (205), rack (VoIP,1) and location in rack (A thru J)

(3) Labeling

All patch panels shall be labeled to indicate the patch panel name. Labels shall be machine-generated, high contrast and between 1/2" and 1" high.

g. Copper Data Cabling and Systems

(1) Labeling

All cable shall be labeled both at the outlet and the patch panel with an alpha/numeric identification code using the following format: The patch panel will point to the room (237) and the outlet location the cable terminates in (10) is: 237.10. Outlet 10 in room 237 will point to the IDF room number (239) and rack ID (1) and patch panel location (D) and port (23) i.e.: 239.1.D.23.

(2) Voice Cabling and Systems

For Fire Alarm lines "Room FA-1 /Room FA-2", for Elevator phones "Room Elev 1 / Room Elev 2", and for Emergency phones "Room Emer 1 /Room Emer 2".

7. FIELD QUALITY CONTROL

a. Test Notice: Provide at least 10 days' notice in writing when the system is ready for final acceptance testing.

b. Acceptance Tests: Include the following for each pair or conductor of each cable run.

(1) 100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition, and presence of AC voltage.

(2) Data horizontal wiring pairs shall be tested from the TCO to the patch panel or block, the basic link test.

c. Data cables shall be tested for conformance to the specifications of TIA/EIA-568-B.2.10 for CAT6A copper cable.

- (1) Wire Mapping shall be done to ensure proper wiring and connectivity. Test for:
 - Continuity, end-to-end.
 - Shorts between any two or more conductors.
 - Crossed pairs
 - Reversed pairs
 - Split pairs
 - Other mis-wirings
 - Document as Pass / Fail
 - (2) Length shall be measured. Indicate the length of the cable as the pair with the shortest length and record it
 - (3) Attenuation shall be tested with a remote signal injector and a reading made at the local end. Evaluate the worst pair attenuation and record result on test report.
 - (4) Bi-Directional NEXT. Near-end crosstalk (NEXT) shall be tested on all six pair combinations in each four pair cable. Tests for NEXT shall be performed from both the work area outlet location and link origination point.
 - (5) Computer generated test results must be submitted to the Architect.
- d. Re-testing: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify that the total system meets the Specifications and complies with applicable standards.
 - e. Report of Tests and Inspections: Prepare a written record of inspections, tests, and detailed test results in the form of a test log and format the log in cable ID number order.

END OF SECTION 271000

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 285000 – BI-DIRECTIONAL ANTENNNA SYSTEM (BDA)

A. GENERAL

1. Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local AHJ (Authority Having Jurisdiction). System users shall receive and transmit radio signals from their portable radio units within the building. This shall be accomplished utilizing the following components:
 - a. Bi Directional Amplifiers (Signal Boosters)
 - b. Coaxial Cable
 - c. Antennas
 - d. Cable taps
 - e. Connectors
 - f. Power dividers
 - g. Other components and interconnecting circuitry as required
2. The system shall comply with the requirements of UL2524 In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2013 Edition, NFPA 1225 2022 Edition and 2018 NC Fire Code, as referenced.
3. The entire system shall meet the requirements of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).
4. The work in this section shall include the responsibility for all permit requirements with the AHJ. Where filings require engineer's signature, documents shall be submitted for his review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.
5. Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner.
6. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included
7. The in-building emergency radio communication enhancement system shall use a UL2524, NFPA 72, NFPA 1225 and NCFC 2018 compliant signal booster.
8. Submittals
 - a. Prior to performing any installation work. The fire alarm contractor shall submit complete Shop Drawings to the engineer for review. Upon approval by engineer, the contractor shall submit to AHJ for approval. The shop drawing shall clearly demonstrate compliance with the engineer's plans and specifications. Any non-compliant features must be fully described.
 - b. Shop drawing submittal shall include a copy of the valid FCC-issued general radio operators license who design the system.

9. Authority Having Jurisdiction (AHJ):

- a. The AHJ for Code compliance is the Franklin County Fire Marshal Office. The Contractor shall obtain a permit and field coordinate site Inspections with AHJ. All permits and inspection fees shall be paid by the Contractor.

B. PRODUCTS

1. The system specified shall be based upon UL2524, NFPA 72, NFPA 1225 compliant signal boosters
2. The signal booster shall be a Class B Public Safety type as designated by the FCC or as required by the AHJ.
3. The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA 72, NFPA 1225, and 2018 NC Fire Code. The signal booster shall have both the primary and the secondary power supplies within a waterproof, type-4 approved enclosure.
4. All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product datasheets and technical submittals. The ID must also be displayed on the product as required by the FCC.
5. The signal booster shall be pre-set by the equipment manufacturer for the frequencies specified by the AHJ. Field tuning of RF filters and duplexers is not allowed.
6. UHF and VHF signal boosters shall be band selective type with a maximum 3dB channel bandwidth of 200KHz (Fc +/- 100KHz) per band. Non-selective wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.
7. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed.
8. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building). Systems that produce any measurable level of uplink noise while in standby shall not be allowed.
9. Signal Booster gain shall be rated at minimum of 80dB and the gain shall be adjustable in a minimum of 30dB range. System gain shall be set and documented at the time of the final system test.
10. Maximum Propagation delay of the signal booster system shall be 14μs (microseconds) or as specified by AHJ.
11. The signal booster system shall include built-in automatic supervision of malfunctions of the signal booster and battery system as per NFPA 1225, NFPA 72, and 2018 NC Fire Code. Non-OEM equipment add-ons and modifications to comply with this specification shall not be allowed.
12. A dedicated supervised monitoring panel shall be provided within the emergency command center next to the fire alarm panel / annunciator or other location as designated by AHJ to

annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

- a. Active system failure
 - b. Communication link failure
 - c. Donor antenna malfunction
 - d. Loss of normal AC power
 - e. Failure of battery charger
 - f. Low battery capacity
 - g. Oscillation of active RF emitting devices
 - h. Failure of active RF emitting devices
13. External filters, duplexers, power supplies or other non-OEM additions or modifications of the original equipment shall not be allowed. All duplexers shall be built-in and FCC certified with the signal booster as an complete and fully integrated FCC-certified and UL-Listed unit.
14. All signal booster components shall be contained in a type-4 approved waterproof enclosure. All enclosures shall be painted red with external labeling as required by the AHJ.

C. EXECUTION

1. Design requirements
- a. Contractor shall provide system design as stated in 2018 NC Fire Code section 510.4.
 - b. In-building emergency radio communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.
 - c. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 100% floor area radio coverage.
 - d. General building areas shall be provided with 95% radio coverage or as specified by AHJ.
 - e. The In-building emergency radio communication enhancement systems must provide the following signal strengths:
 - i. Downlink - Minimum signal strength of -95 dBm throughout the coverage area.
 - ii. Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System.
 - iii. OR as otherwise required by the AHJ

- f. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.
 - g. An approved manufacturer or a qualified and approved vendor shall supply, test and determine locations of components which are required for proper operation as well as to supply, install, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.
 - h. Design shall include software-simulated radio propagation modeling with heat maps showing predicted signal coverage levels within the building. The design shall be done by the software certified personnel.
 - i. All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.
 - j. The system design shall be based on the Public Safety Signal Boosters UL2524, NFPA 72, NFPA 1225, 2018 NC Fire Code and FCC certified to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waive any requirement or performance of individual components described in the specifications.
 - k. Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.
 - l. Survivability from attack by fire shall meet requirements of NFPA 72, NFPA 1225, 2018 NC Fire Code or as required by the local jurisdiction.
 - m. The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.
 - n. Antenna isolation shall be maintained between the donor antenna and all inside antennas (Distributed Antenna System – DAS) to a minimum of 20Db under all operating conditions
- 2. Approval prior to installation. Amplification system capable of operating on frequencies licensed to any public safety agency by the FCC shall not be installed without prior coordination and approval of the fire code official.
 - 3. Installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code NFPA-70, NFPA-72, NFPA 1225, 2018 NC Fire Code or as required by the local AHJ.

4. At least 2 independent and reliable power supplies shall be provided as specified in NFPA 72, NFPA 1225 and 2018 NC Fire Code.
5. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72, and NFPA 1225 2022 edition.

The signal booster shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall power on automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage enhancement system for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a waterproof Type-4 approved enclosure. Batteries shall be enclosed in a separate, vented Type-3R approved enclosure. External UPS (Uninterruptable Power Supplies) are not acceptable.

6. RF Coaxial Cable shall be a listed, CMP plenum. Non-plenum cable can be used when installed in a metallic raceway. The cable classification shall be clearly marked on the outer surface of the cable regular intervals.
7. Acceptance and Test Procedures
 - a. The acceptance test procedure shall be as stated in 2018 NC Fire Code section 510.5.3 or as directed by the AHJ.
 - b. Acceptance testing for an in-building radio system is required upon completion of installation.
 - c. The coverage testing shall be done in accordance with NFPA 72, NFPA 1225, 2018 NC Fire Code and as required by the local AHJ
 - d. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.
 - e. All test records along with system diagrams, design, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project, and as required by the AHJ.

END OF SECTION 283100

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 285500 - RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA/REPEATER
SYSTEM

A. GENERAL

1. SUMMARY

- a. The purpose of this specification is to establish the requirements and standards for initial survey for public safety radio signal strength per NFPA and 2018 NC Fire Code.
- b. Survey should be performed after the building is substantially completed, and prior to start of installation of electrical wiring.
- c. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength of Emergency Responder Radio Signal into the building and determine if amplification of the signal is required. Both inbound and outbound signal strength shall be determined, measured, calculated and documented as required by code.

2. SURVEY CRITERIA IF REQUIRED

- a. The required Public Safety Radio Signal Level inside the Owner's facility must be determined per code, ordinance, or AHJ
- b. Survey shall be performed by an FCC licensed technician holding a current GROL license. Honeywell Fire have distributors that meet these requirements.

3. REGULATIONS

- a. Codes, regulations and standards referenced in the Section are:
 - i. NFPA 1 – The National Fire Code
 - ii. NFPA 70, 2020 Edition – The National Electrical Code
 - iii. NFPA 101, Life Safety Code
 - iv. NFPA 72, 2013 Edition - National Fire Alarm Code
 - v. FCC 47 CFR Private Land Mobile Radio, Part 90.219 Services-Use of Signal Boosters
 - vi. 2018 NC Building and Fire Codes
 - vii. ADA "Americans with Disabilities Act"
 - viii. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields"
 - ix. FCC Rules Part 22, Part 90 and Part 101
 - x. NFPA 1225 2022 Edition
 - xi. UL 2524

4. DEFINITIONS

a. Definitions:

- i. Bi-Directional Amplifier BDA: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.
- ii. Emergency Responder Radio Coverage System: A two-way radio communication system installed to assure the effective operation of radio communications systems for fire, emergency medical services, or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.
- iii. FCC: Federal Communications Commission
- iv. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
- v. Public Safety/First Responder: Public Safety or First Responder agencies that are charged with the responsibility of responding to emergency situations. These include, but are not limited to law enforcement departments, fire departments, and emergency medical companies.
- vi. RSSI: Received signal strength indicator RSSI is a measurement of the power present in a received radio signal.
- vii. BER: Bit Error Rate is the number of bit errors per unit time
- viii. GROL- FCC General Radio Operators License
- ix. ERRCES- Emergency Responder Radio Coverage Enhancement System
- x. DAS-Distributed Antenna System

B. EXECUTION

1. TESTING PROCEDURES

- a. Minimum Signal Strength: For testing system signal strength and quality, the testing shall be based on the -95dBm nominal signal at 100%.
- b. Spectrum Analyzer or Calibrated Handheld Radio shall be used as basis for signal measurements or other method as approved by AHJ.
- c. Testing should be based on a minimum of 20 grid locations per floor OR maximum of 1600 SQ ft. areas if the floor exceeds 32,000 Sq. Ft. Also, testing should include all critical areas per NFPA. See A.2 of this specification and NFPA 72 2013 or NFPA 1225 2022. OR per any method determined by the AHJ, local code or ordinance.
- d. A minimum signal strength of -95 dBm shall be provided throughout the coverage area for both uplink and downlink by the Local Fire Department.
 - i. RSSI measurement only

2. SURVEY SUBMITTALS

- a. Submit testing data for each level of the building.
 - i. An RF measurement drawing of each floor of the building which indicates relative RF field strength for each frequency band of interest must be submitted to the AHJ.
 - ii. The drawing should indicate clearly the areas that have passed or failed based on the above parameters.

END OF SECTION 285500

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 27 41 00
COMMON WORK RESULTS FOR AUDIO VISUAL SYSTEMS

PART-1 GENERAL**1.01 SECTION INCLUDES**

- A. It is the intention of this specification and the accompanying AV drawings to describe and provide for the completion of audio-visual systems including furnishing, installing, testing, and placing in satisfactory and fully operational condition. All equipment, materials, devices, and necessary accessories to provide a complete and fully operational audio visual (AV) system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown on the drawings.
- B. These specifications are intended as a standard of quality, function, performance, and appearance that will be considered as acceptable. Brand names are used to establish a minimum level of quality and performance.

1.02 REFERENCED STANDARDS

- A. The latest versions of the following codes, standards, and guidelines shall be followed. Bring to Architect's immediate attention where construction documents or conditions differ from requirements in codes, standards, guidelines, and specifications.
- B. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
- C. ANSI/TIA 568-C.1, Commercial Building Telecommunications Cabling Standard
- D. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- E. ANSI/TIA-568-C.4, Broadband Coaxial Cabling and Components Standard
- F. TIA-569-C, Commercial Building Standard for Telecommunications Pathways and Spaces
- G. BICSI-003 Information Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities

1.03 SECTION INCLUDES:

- A. General - The work as described in the following sections shall be furnished and installed by one firm alone. The audio-visual systems contractor shall furnish and install all equipment including signal and control wiring for the audio-visual systems described herein.
 - 1. Section 27 41 03 – Conductors and Cables for Audio Visual Systems
 - 2. Section 27 41 05 – Cabinets and Enclosures for Audio Visual Systems
 - 3. Section 27 41 10 – Integrated Control System for Audio Visual Systems
 - 4. Section 27 41 30 – Video for Audio Visual Systems
 - 5. Section 27 41 40 – Audio for Audio Visual Systems
 - 6. Section 27 41 60 – Digital Recording for Audio Visual Systems
 - 7. Section 27 41 70 – Paging System for Whole Building
- B. Products – Acceptable products are specified within each section under division 27.
- C. Execution – Standards requirements are specified within each section under division 27. Commissioning protocol procedures can be found at Section 274100 – Common Work Results for Audio Visual Systems, Article 10, Commissioning Protocol Procedures.
- D. Provide complete and operable systems as described herein.
- E. Work Includes:
 - 1. Provision of complete audio-visual systems.
 - 2. The Contractor shall generate all shop drawings and information for the complete installation and wiring of the system. The Contractor shall provide (or sub- contract for) the on-site installation and wiring and shall provide on-going supervision and coordination during the implementation phase. Contractor shall be required to complete equipment manufacturer(s) training to install specified audio-visual systems.

3. The Contractor shall be responsible for the initial and final adjustment of the systems as herein prescribed and shall provide all test equipment for the system checkout and acceptance tests. Contractor shall be required to complete equipment manufacturer(s) training to commission specified audio visual systems.
4. Preparation of a project management schedule, including a timeline for equipment procurement and installation of all AV systems.

1.04 WORK IN OTHER DIVISIONS

- A. See all other divisions of specifications for other work which includes but is not limited to:
 1. Coordination of all conduits, wire ways, connection boxes, pull boxes, junction boxes, and outlet boxes permanently installed in walls, floors, and ceilings for use with the audio-visual systems.

1.05 CONTRACT DRAWINGS

- A. The drawings do not show all requirements of the specifications. The drawings and specifications are complementary and what is called for (or shown) in either is required to be provided as if called for in both. If in conflict, the specifications shall take precedence.
- B. Equipment racks, connection panels, and all other associated devices are shown diagrammatically only and indicate the general character and approximate location. Furnish, install, and place in satisfactory condition, all AV equipment, cabling and all other materials required for the systems shown or noted in the contract documents, so that it is a complete system which is fully operational and fully tested.

1.06 CONTRACTOR QUALIFICATIONS

- A. The work of this division will be contracted to a single firm, referred to as the Contractor, for undivided responsibility and is licensed to perform work of this type in the project jurisdiction.
- B. The Contractor shall also have underway or completed at least one court facility audio visual recording and sound system project of a size and scope comparable to the project described herein at the time of bid opening.
- C. The Contractor shall have at least ten (10) years of verifiable direct experience with the devices, equipment and systems of the type and scope specified herein.
- D. The Contractor's past project references shall confirm satisfactory installation, performance, and service on the Integrator's other work. Any report of uncorrected deficiencies leading to system removal and replacement will be grounds for disqualification.
- E. The Contractor shall have three years minimum experience specifically in court audio visual systems, capable of repairing and programming all installed equipment.
- F. The Contractor shall have a corporate office and shall have capabilities and in-house facilities for assembly, shop fabrication and repair service of professional audio-visual systems and shall be factory trained by the specified audio visual equipment vendor, court recording vendor, digital signage vendor and any other vendor as specified herein.
- G. The Contractor shall have on his full-time payroll staff members having five years minimum experience as an audio-video installer. Must have at a minimum of ten technicians. Prior to bid acceptance, the qualifications of the staff member who will be assigned to this project shall be submitted for the approval of the Architect. Said staff member shall:
 1. Provide all technical liaisons between the Contractor and the Architect.
 2. Represent the Contractor at meetings and conferences and be present at the job site for final inspection.
 3. Be responsible for supervision of all technical and engineering work required executing the contract, and, in particular, approving and signing all shop drawings.
- H. Quality of Materials and Equipment
 1. All materials and equipment supplied by the Integrator shall be new and shall meet or exceed the latest published specification of the manufacturer in all respects.
 2. At the time of submittal the Integrator shall supply the latest model for each piece of equipment.

3. All equipment shall be UL listed, or equivalent.

1.07 CODES, PERMITS, INSPECTION FEES

- A. Conform to all State and Local ordinances. If any conflict occurs between government adopted code rules and this specification, the codes shall govern. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:
 1. American National Standards Institute (ANSI).
 2. National Electrical Code (NEC).
 3. National Fire Protection Association (NFPA).
 4. Underwriter's Laboratories (UL).
- B. Install the audio-visual systems based on the following:
 1. NFPA 70: National Building Code as adopted and amended by the Local Jurisdiction.
 2. IBC: International Building Code as adopted and amended by the Local Jurisdiction.
- C. The referenced codes establish a minimum level of requirements. Compliance with code requirements shall not be construed as relieving the Contractor from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same rules governing work specified herein.

1.08 COORDINATION

- A. The Contractor shall continually interface and coordinate the work with the work of other Contractors and/or other trades and shall examine all drawings and specifications of other trades including the mechanical, electrical, and structural for construction details and coordination.
- B. Obtain submittals, shop drawings, and other information for all equipment to be furnished by the Owner or under other divisions of the specifications in relation to division 27.
- C. Special attention is called to the following items for coordination.
 1. Conduit, cable tray, boxes, and other raceway components.
 2. Location of casework, cabinets, counters, doors, and equipment racks so that all equipment is clear of and in proper relation to these items.
 3. Mounting, recessing and concealing video projectors, visual displays, speakers and other associated equipment in specially constructed casework and niches.
- D. Prior to roughing-in, verify the exact location of all devices with Architect.
- E. The Contractor shall schedule its work to prevent conflicts with other activities in the building and shall execute without claim for extra payment or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- F. The Contractor will not be paid for work associated with the relocation of equipment, conduits, cabling, or any other materials requiring removal or reinstallation as a result of a lack of sufficient coordination prior to installation.

1.09 SUBMITTALS AND SHOP DRAWINGS

- A. Submittals:
 1. Equipment list, based on the specified equipment and other additional equipment or materials needed for complete systems.
 2. Product data with index and divider tabs by specification section, with brochures and/or catalog cuts for all items of equipment and hardware, in a .pdf format. Clearly identify each component. One hard copy in an 8.5"X11" paper binder and one electronic copy required.
 3. Descriptions of specially fabricated items.
 4. Equipment submittals and shop drawings will be submitted simultaneously.
 5. In the event that the initial submittal is not incomplete or is not accepted due to failure to comply with this specification, including content and format of the submittal, the Contractor shall assume the cost for evaluation of all resubmittals.
- B. Shop Drawings: Submit shop drawings showing the items and systems and how the components of an item or system are to be assembled, interconnected, function together and how they will be

installed on the project. System layout drawings shall show floor plans with complete device layout and point-to-point wiring and connection diagrams between all components of the system.

- C. Shop Drawings are required for:
1. Floor plans, showing the layout of devices and cabling and wiring within raceway systems. Include the number of cables, type of cables, and size of raceway for each run.
 2. Single line diagrams showing model numbers of each component. Include wire numbers for each connection, with numbers corresponding to those of the wire-run list.
 3. Wiring diagrams showing point to point connections between components. Include wire numbers and color-coding for each connection point, with numbers corresponding to those of the wire-run list.
 4. Rack panel layout for each equipment cabinet.
 5. Scaled and dimensioned drawings of all custom assemblies and fabricated items, including but not limited to the following. Include details of all components, materials, finishes, and colors.
 - a. Control panel mounting
 - b. Loudspeaker mounting frames and hardware
 - c. Screen mounting/monitor mounting
 - d. Input / Output panels, including mounting of panels in casework.
 - e. Digital signage mounting
- D. The Contractor agrees that submittals and shop drawings processed by the Architect are not change orders; that the purpose of submittals and shop drawings by the Contractor is to demonstrate to the Architect that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install, and by detailing the fabrication and installation methods he intends to use. The Contractor alone accepts all responsibility for assuring that all materials furnished under this Division of the specifications meet in full all requirements of the contract documents. Architect's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes and for techniques of assembly.

1.10 COMMISSIONING PROTOCOL PROCEDURES

- A. Commission protocol procedures shall govern over each section within Division 27 as described in the specifications of the individual sections.
- B. Within 30 days of audio-visual system pre-test, contractor shall submit for review and approval sample documentation and procedures used for commissioning to Architect. Documentation shall include system functions and feature with explanations.
- C. After each system has been pre-tested and the Contractor has submitted the pretest results and certification to the Architect, the Contractor shall schedule acceptance test date. The Contractor shall provide the Architect 30 days advance written notice of the date the acceptance test is expected to begin.
- D. The audio-visual systems shall be tested utilizing the approved test equip to certify each system's proof-of-performance. Each system test shall verify that total system meets all the requirements of this specification under full operating conditions. Additional testing requirements can be found in the individual specifications of Division 27.
- E. At the conclusion of the Acceptance Test, using the approved generated punch list (or discrepancy list) the Contractor shall certify the results of the test, and reschedule testing on deficiencies and shortages, if any, with the Architect. Any retests that are needed to reach agreement on the results of these tests or to later establish compliance with these specifications will be done at the Contractor's expense.

1.11 WARRANTY

- A. Provide a written three (3) year warranty, signed by Contractor.

- B. Include the following provisions:
 - 1. Warranty all equipment and the installation to be free of faulty workmanship.

END OF SECTION

This page intentionally left blank

SECTION 27 41 03
CONDUCTORS AND CABLES FOR AUDIO VISUAL SYSTEMS

PART 1 - GENERAL**1.01 SUMMARY**

- A. Video connectivity
- B. Audio connectivity
- C. Network/control connectivity

1.02 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment including audio/video signal and control wiring for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems

1.03 QUALITY ASSURANCE

- A. Integrator's Qualifications:
 - 1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.
 - 2. The Contractor qualifications are specified in Section 27 41 00, 1.07, CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
 - 1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters.
 - b. UL - Underwriters Laboratories
 - c. EIA - Electrical Industries Association
 - d. NEC - National Electrical Code
- C. Prior to installation of cables, conductors or connectors, submittal of shop drawings must be approved by contracting office as described in Section 27 41 00, 1.10, SUBMITTALS AND SHOP DRAWINGS.

PART 2 – PRODUCTS**2.01 MATERIALS AND COMPONENTS**

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 VIDEO CONNECTIVITY

- A. All video connectivity between the video cameras, video monitors and video input devices to the equipment rack head end equipment must utilize CAT6 plenum rated cabling and/or Type RG 6/U Plenum 18 AWG Bare Copper Serial Digital cable .
- B. All video connectivity between the video cameras, video monitors and video input devices to the equipment rack head end equipment will be terminated with RJ45 and/or RG6 Compression BNC type connectors.
- C. Video shall be transmitted over twisted pair utilizing CAT6 cables when specified. Where coax cabling within the equipment cabinets is necessary, use RG 59, 75 ohm, UL Listed NEC Type CM or CMR, 20 AWG solid bare copper center conductor with 95% coverage tinned copper outer shield and 100% aluminum/polypropylene foil inner shield, PVC jacketed cable and shall be Belden No. 1505A, West Penn No. 819 or equal. Where coax would be required by the system manufacturer for field runs, provide baluns and CAT6 cables as described in in this Section.

2.03 AUDIO CONNECTIVITY

- A. All audio connectivity between the microphones, video monitors and video input devices to the equipment rack head end equipment must utilize CAT6 plenum rated cabling.
- B. All audio connectivity between the microphones, video monitors and video input devices to the equipment rack head end equipment will be terminated with RJ45 type connectors.
- C. Inter connection between components within the equipment rack shall utilize necessary cable types such as HDMI, VGA, etc. pre-molded cables.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. Provide wire and cables which are required to connect and fully integrate audio visual systems as specified within each section under Division 27 and as shown in detail on the AV drawings.
- B. Provide complete interconnected operable systems as described under Division 27.
- C. To the greatest extent possible, install wire and cable only within the raceway systems being provided by the electrical contractor. Do not install wire or cable in wall cavities or ceiling plenums/attic spaces without the use of raceway (conduit or cable tray), without the explicit written permission of the Architect, or as otherwise noted on the drawings.
- D. Number each cable. Number individual conductors of cables to identify circuits and connections.
- E. Record number codes on the "AS-BUILT" drawings.
- F. Cable ties shall be placed at appropriate intervals of no greater than twelve inches for vertical bundles, twelve inches for horizontal bundles.
- G. Do not use cable ties in the cable tray or overhead junction boxes.
- H. Cable assemblies shall utilize a service loop so that equipment in racks or equipment consoles can be fully pulled out for service without cutting wire ties or putting undue stress on cable assemblies.
- I. Cable assemblies run in conduit and/or cable trays should provide for a minimum of 3 feet of excess cable on each end to allow for relocation of equipment or re-termination of cable in the future.
- J. All vertical cable bundles shall be attached to the rack frame.
- K. All cables shall be continuous lengths without splices.
- L. Cables shall not protrude from the back of racks.
- M. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.

3.02 ACCEPTABLE PRODUCTS

- A. The products named in this section establish minimum qualities that substitutions must meet to be considered acceptable. The specified products have also been used in preparing the drawings and

specifications, and therefore establish the basis for equipment sizing, wire and cable design, raceway design, power consumption, heat dissipation, and other design parameters.

- B. Video connectivity
 - 1. 23 AWG 4 Pair Bare Copper, Shielded Plenum Rated Category 6.
 - 2. RJ45 Connector shielded plug.
 - 3. 24 AWG Category 6 Unshielded Twisted Pair (UTP) Cable.
 - 4. RJ45 Connector unshielded plug.
 - 5. Type RG 6/U Plenum, 18 AWG Bare Copper Serial Digital.
 - 6. RG6 Compression BNC.
- C. Audio connectivity
 - 1. 23 AWG 4 Pair Bare Copper, Shielded Plenum Rated Category 6.
 - 2. RJ45 Connector shielded plug.
 - 3. 24 AWG Category 6 Unshielded Twisted Pair (UTP) Cable.
 - 4. RJ45 Connector unshielded plug.
- D. Network/control connectivity
 - 1. 23 AWG 4 Pair Bare Copper, Shielded Plenum Rated Category 6.
 - 2. RJ45 Connector shielded plug.
 - 3. 24 AWG Category 6 Unshielded Twisted Pair (UTP) Cable.
 - 4. RJ45 Connector unshielded plug.

END OF SECTION

This page intentionally left blank

SECTION 27 41 04
GROUNDING AND BONDING FOR AUDIO VISUAL SYSTEMS

PART 1 GENERAL**1.01 SYSTEM DESCRIPTION**

- A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere.
- B. General
 - 1. Protection:
 - a. Protection of power circuits entering equipment racks.
 - b. Protection of power circuits feeding flat panel video displays.
 - c. Protection of power circuits feeding podiums.
 - 1) Ground circuitry for proper dissipation of lightning, voltage spikes, surges, transients and as required for life safety.
 - 2. Power Sequencing and Control:
 - a. Provide sequencing of Audio/Visual systems electronics power receptacles and distribution devices.
 - b. Sequencing shall be activated with a single action.
 - c. Integrate power sequencer with Integrated Control systems specified in 274110.
 - d. Sequencing shall be configured to power source, mixing, and processing equipment first, followed by amplification. Provide sufficient delay to eliminate potential for signal pop when low voltage sources are powered.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 27 Specification Sections, apply to this Section.
- B. The work of this specification is shown on the AV series of drawings and equipment schedules.
 - 1. Section 27 41 00 – Common Work Results for Audio Visual Systems
 - 2. Section 27 41 03 – Conductors and Cables for Audio Visual Systems
 - 3. Section 27 41 05 – Cabinets and Enclosures for Audio Visual Systems
 - 4. Section 27 41 10 – Integrated Control System for Audio Visual Systems
 - 5. Section 27 41 30 – Video for Audio Visual Systems
 - 6. Section 27 41 40 – Audio for Audio Visual Systems
 - 7. Section 27 41 50 – IPTV systems for Audio Visual Systems
 - 8. Section 27 41 60 – Courtroom Technology for Audio Visual Systems

1.03 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio visual systems Contractor shall furnish and install all equipment including audio/video signal and control wiring for the audio visual systems described herein.
- B. The work shall be provided complete and the systems shall be fully operational. The audio visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.

1.04 QUALITY ASSURANCE

- A. Integrator's Qualifications:
 - 1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.

2. The Contractor qualifications are specified in Section 27 41 00, 1.07, CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
 1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters.
 - b. UL - Underwriters Laboratories.
 - c. EIA - Electrical Industries Association.
 - d. NEC - National Electrical Code

PART 2 PRODUCTS

2.01 GENERAL MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.
- D. Substitutions of equal quality will be accepted. All substitutions are to be approved prior to bid and listed by addenda. Substitutions may not be accepted after the schedule bid time.

2.02 SEQUENCED RACK MOUNT POWER AND LINE PROTECTION

- A. Specifications:
 1. 9'SignalSAFE Cord.
 2. 120VAC nominal line voltage.
 3. 15 amp maximum Peak Load.
 4. 12 amp maximum Continuous Load.
 5. Input Voltage Alert: Low:105VAC-110VAC; High: 123VAC-128VAC.
 6. Load Current Alert: Low: 0A; Maxi 5A.
 7. Peak Impulse Current: 30,000 amps, one time; 29,500 amps,two times.
 8. Protections: Line to neutral.
 9. Response Time: Less than 1 nano second.
 10. Surge Energy Dissipation: 711 joules.

2.03 RACK MOUNT POWER LINE SURGE PROTECTION

- A. Specifications:
 1. Nominal Line Voltage: 120VAC.
 2. Maximum Line Current: 15 Amps.
 3. Maximum Allowable Voltage: 125 VAC.
 4. Peak Impulse Current: 8/20 micro seconds, 10,000 amps one time.
 5. Maximum Clamping Voltage: 395 Volts at 100 amps.
 6. Response Time: Less than 1 nanosecond.
 7. EMI/RF Suppression: More than 20 dB.

2.04 FLAT PANEL DISPLAYS

- A. Specifications:
 1. Load Rating: 8 amps @120 volts.
 2. Power Requirements: 10 Watts.
 3. UL Adjunct Class. Test Results : 1000 surges, 6000 volts, 3000 amps, C1 pulse, measured suppressed voltage290 volts, no failures.
 4. Federal Guidelines: Grade A, Class 1, Mode 1.

5. EMI/RFI Filter, Normal Mode: 40 dB@ 100 kHz, 50 dB @ 300 kHz.
6. Max. Applied Surge Pulse Joule Rating: Unlimited, due to current limiting.
7. Maximum Applied Surge Pulse Voltage: 6000 volts (1.2 x 50 us pulse).
8. Overvoltage Shutdown: 145 volts

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide components which are required to connect and fully integrate audio visual systems as specified within each section under Division 27 and as shown in detail on the AV drawings.
- B. Provide complete interconnected operable systems as described under Division 27.
- C. Equipment shall be firmly secured, plumb and level.
- D. Ground all equipment as per manufacturers recommendations, IEEE 1100, NEC and EIA/TIA guidelines.
- E. Provide equipment grounding conductor from equipment, grounding lugs to ground bar. Size conductor based on length.
- F. Provide green insulated grounding conductor from rack to ground bar.
- G. Grounding of audio cables and peripheral equipment shall be installed per manufacturers direction to eliminate noise induction and achieve optimum system performance.
- H. All vertical cable bundles shall be attached to the rack frame.
- I. All cables shall be continuous lengths without splices.
- J. Cables shall not protrude from the back of racks.
- K. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.

3.02 GROUNDING

- A. All equipment shall be grounded in accordance with the NEC, these specifications, and the equipment supplier's recommendations. Discrepancies shall be brought to the attention of the Architect for resolution prior to execution of the work.
- B. Power ground system and A/V isolated ground system shall remain physically separated throughout the facility and terminated at a single point on ground buss bar in the equipment room.
- C. Each equipment cabinet shall be bonded and grouped cabinets shall be bonded together and connected at a single point on ground buss bar.

3.03 ACCEPTABLE PRODUCTS

- A. The products named in this section establish minimum qualities that substitutions must meet to be considered acceptable. The specified products have also been used in preparing the drawings and specifications, and therefore establish the basis for equipment sizing, wire and cable design, raceway design, power consumption, heat dissipation, and other design parameters.
- B. Power Sequencer:
 1. Middle Atlantic RLNK-SW820R-SP. Typical of AV cabinet.
 2. Surgex.
 3. Furman.
 4. Substitutions: See Section 01 60 0 - Product Requirements.
- C. Surge Protection:
 1. Middle Atlantic PD-915R. Typical of AV Podium.
 2. Furman.
 3. Surgex.
 4. Substitutions: See Section 01 60 0 - Product Requirements.
- D. Flat Panel Protection:
 1. Middle Atlantic PD-28-SP. Typical of all flat panels displays.

2. SurgeX.
3. Furman.
4. Substitutions: See Section 01 60 0 - Product Requirements.

END OF SECTION

SECTION 27 41 05
CABINETS AND ENCLOSURES FOR AUDIO VISUAL SYSTEMS

PART 1 - GENERAL**1.01 SUMMARY**

- A. Typical Courtroom
- B. Multi-Purpose Room
- C. Paging Head End

1.02 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems.
- E. Typical Courtroom
 - 1. Each Typical Courtroom shall have a 27RU equipment rack with solid front and rear door. Verify locations and quantities on AV drawings.
 - 2. EIA compliant stand-alone / gangable equipment rack with 27 rack spaces, useable depth shall be 23.47". Rack shall be of fully welded construction.
 - 3. Each Typical Jury Courtroom equipment rack shall have a rack mounted UPS.
 - a. Rack mount; 2RU.
 - b. 120VAC input, single phase.
 - c. 120VAC output (plug), single phase (5-20A).
 - d. 2.2kVA, 1.8kW double-conversion.
 - e. LCD interface reports operating mode plus 9 selectable screens of UPS data (Load % & kW, Load % & kVA, Power factor, Input volts & Hz, Output volts & Hz, Battery volts and charge %, Minutes runtime, Capacity remaining, Kw/hr. consumption)
 - f. USB and DB9 serial connectors.
 - g. Two switched 3-outlet load banks support remote reboot or programmable load shedding options
 - h. Single line TEL / Network surge suppression
 - i. Electronic bypass maintains utility output during a variety of UPS fault conditions
 - j. Battery independent restart ensures automatic UPS power-up without user interaction after lengthy power outages, even when batteries are expired and require replacement.
 - 4. Verify rack locations and quantities on the AV drawings.
 - 5. Provide plug strips as required to connect AC power to all associated equipment in racks, equipment consoles and custom mounting enclosures.
 - 6. Provide a minimum of one plug strip per rack.
- F. Multi-Purpose Room
 - 1. The Multi-Purpose Room shall have a 27RU equipment rack with solid front and rear door. Verify locations and quantities on AV drawings.
 - 2. EIA compliant stand-alone / gangable equipment rack with 27 rackspaces, useable depth shall be 23.47". Rack shall be of fully welded construction.
 - 3. Multi-Purpose room equipment rack shall have a rack mounted UPS.
 - a. Rack mount; 2RU.

- b. 120VAC input, single phase.
 - c. 120VAC output (plug), single phase (5-20A).
 - d. 2.2kVA, 1.8kW double-conversion.
 - e. LCD interface reports operating mode plus 9 selectable screens of UPS data (Load % & kW, Load % & kVA, Power factor, Input volts & Hz, Output volts & Hz, Battery volts and charge %, Minutes runtime, Capacity remaining, Kw/hr. consumption)
 - f. USB and DB9 serial connectors.
 - g. Two switched 3-outlet load banks support remote reboot or programmable load shedding options
 - h. Single line TEL / Network surge suppression
 - i. Electronic bypass maintains utility output during a variety of UPS fault conditions
 - j. Battery independent restart ensures automatic UPS power-up without user interaction after lengthy power outages, even when batteries are expired and require replacement.
- 4. Verify rack locations and quantities on the AV drawings.
 - 5. Provide plug strips as required to connect AC power to all associated equipment in racks, equipment consoles and custom mounting enclosures.
 - 6. Provide a minimum of one plug strip per rack.
- G. Paging Head End
- 1. The Paging head end equipment shall have a 8RU wall mounted equipment rack with solid front and rear door.
 - 2. The Paging head end room equipment rack shall have a rack mounted UPS.
 - a. Rack mount; 2RU.
 - b. 120VAC input, single phase.
 - c. 120VAC output (plug), single phase (5-20A).
 - d. 2.2kVA, 1.8kW double-conversion.
 - e. LCD interface reports operating mode plus 9 selectable screens of UPS data (Load % & kW, Load % & kVA, Power factor, Input volts & Hz, Output volts & Hz, Battery volts and charge %, Minutes runtime, Capacity remaining, Kw/hr. consumption)
 - f. USB and DB9 serial connectors.
 - g. Two switched 3-outlet load banks support remote reboot or programmable load shedding options
 - h. Single line TEL / Network surge suppression
 - i. Electronic bypass maintains utility output during a variety of UPS fault conditions
 - j. Battery independent restart ensures automatic UPS power-up without user interaction after lengthy power outages, even when batteries are expired and require replacement.
 - 3. Verify rack locations and quantities on the AV drawings.
 - 4. Provide plug strips as required to connect AC power to all associated equipment in racks, equipment consoles and custom mounting enclosures.
 - 5. Provide a minimum of one plug strip per rack.

1.03 QUALITY ASSURANCE

- A. Integrator's Qualifications:
- 1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.
 - 2. The Contractor qualifications are specified in Section 27 41 00, 1.07, CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
- 1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters
 - b. UL - Underwriters Laboratories
 - c. EIA - Electrical Industries Association
 - d. NEC - National Electrical Code

- C. Prior to installation of cables, conductors or connectors, submittal of shop drawings must be approved by contracting office as described in Section 27 41 00, 1.10, SUBMITTALS AND SHOP DRAWINGS.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words “or equal product meeting the performance requirements of this Section”.
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
 - 1. Satisfaction of all performance data listed in this Section.
 - 2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 - 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Typical Courtroom System
 - 1. Middle Atlantic ERK SERIES RACK, 27 RU, 28"D, ERK-2728LRD
 - 2. Minuteman® Endeavor™ 5-10kVA Series UPS ED5000RTXL
 - 3. Substitutions: See Section 01 60 0 - Product Requirements.
- D. Multi-Purpose Room
 - 1. Middle Atlantic ERK SERIES RACK, 27 RU, 28"D, ERK-2728LRD
 - 2. Minuteman® Endeavor™ 5-10kVA Series UPS ED5000RTXL
 - 3. Substitutions: See Section 01 60 0 - Product Requirements.
- E. Paging head end room
 - 1. Middle Atlantic EWR-8-17SD
 - 2. Minuteman® Endeavor™ 5-10kVA Series UPS ED5000RTXL
 - 3. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Supply completely assembled equipment racks with all internal wiring completed as required to provide a complete system, to the extent that such items are not provided by others.
- B. Verify rack locations on the AV drawings.

END OF SECTION

This page intentionally left blank

SECTION 27 41 10
INTEGRATED CONTROL SYSTEM FOR AUDIO VISUAL SYSTEMS

PART 1 - GENERAL**1.01 SUMMARY**

- A. Typical Courtroom
- B. Multi-Purpose Room
- C. Paging Head End

1.02 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems.
- E. Typical Courtroom
 - 1. Integrated software application control of audio-visual system
 - a. Audio visual system level adjustments including microphone levels camera settings and system modes.
 - b. Audio visual system digital recording control including starting and stopping the audio-visual system digital recorders.
 - c. Views live and confidence monitoring streams from the digital recorder.
 - d. Monitor audio levels on mixers and at all recorders.
 - e. Role based rights and access, case sealing and mode creation.
 - f. Activate/control instant review which will allow operator to quickly playback previously recorded testimony while still recording. Shall be displayed and heard over the courtroom monitors.
 - 2. Global control from one or more simultaneous locations within the LAN and ability to control other rooms from any location within the LAN with user rights and access management.
 - 3. Integrated touch control at the judges' bench location with touch monitor.
 - a. Control the audio-visual system recording and playback from Judge's touch monitor.
 - b. The touch monitor shall be used to select the desired video source that is to be displayed on the monitors.
 - c. Ability to control thermostat, HVAC, lights, shades, alarms, security if specified in related sections.
 - d. Ability to turn A/V feed to monitors on/off from touch monitor.
 - e. Within the touch monitor screen, provide a video monitoring window defined by the contracting office during developmental meeting.
 - f. Use multiple pages as necessary to provide all controls. Organize pages for intuitive use according to function and mode. Provide 3D animation to buttons. Use color, placement, and groupings to organize controls and information.
 - g. Activate system modes and camera locks of the audio-visual system.
 - h. Operate a keypad for telephone calls and phone-in testimony of the integrated teleconference device.

- i. Control of the integrated video conference unit, such as recall of preset dialing list, manual dialing, accepting calls, and muting of audio and/or video shall be made through the control system via the Judge's touch monitor for the audio-visual system.
 - j. Exclude witness and all other courtroom functions and mode selections shall be included on the touch control monitor.
 - k. Graphical user interface (GUI) shall be approved by contracting office before integration. GUI should be easy to use, and the software menu shall be customized based on input from the end users to provide intuitive controls.
 - l. Ability to edit, update and create GUI with a drag and drop editor that is cloud based.
 - m. Verify size and location of touch monitor on the AV drawings.
- F. Multi-Purpose Room
- 1. Integrated software application control of audio-visual system
 - 2. Audio visual system level adjustments including microphone levels camera settings and system modes.
 - a. Audio visual system digital recording control including starting and stopping the audio-visual system digital recorders.
 - b. Views live and confidence monitoring streams from the digital recorder.
 - c. Monitor audio levels on mixers and at all recorders.
 - d. Role based rights and access, case sealing and mode creation.
 - e. Activate/control instant review which will allow operator to quickly playback previously recorded testimony while still recording. Shall be displayed and heard over the courtroom monitors. Instant review should include a minimum of seven (7) previous days of recording.
 - 3. Global control from one or more simultaneous locations within the LAN and ability to control other rooms from any location within the LAN with user rights and access management.
 - 4. Integrated touch control at the judges' bench location with touch monitor.
 - a. Control the audio-visual system recording and playback from Judge's touch monitor.
 - b. The touch monitor shall be used to select the desired video source that is to be displayed on the monitors.
 - c. Ability to control thermostat, HVAC, lights, shades, alarms, security if specified.
 - d. Ability to turn A/V feed to monitors on/off from touch monitor.
 - e. Within the touch monitor screen, provide a video monitoring window defined by the contracting office during developmental meeting.
 - f. Use multiple pages as necessary to provide all controls. Organize pages for intuitive use according to function and mode. Provide 3D animation to buttons. Use color, placement, and groupings to organize controls and information.
 - g. Activate system modes and camera locks of the audio-visual system.
 - h. Operate a keypad for telephone calls and phone-in testimony of the integrated teleconference device.
 - i. Control of the integrated video conference unit, such as recall of preset dialing list, manual dialing, accepting calls, and muting of audio and/or video shall be made through the control system via the Judge's touch monitor for the audio-visual system.
 - j. Exclude witness and all other courtroom functions and mode selections shall be included on the touch control monitor.
 - k. Graphical user interface (GUI) shall be approved by contracting office before integration. GUI should be easy to use, and the software menu shall be customized based on input from the end users to provide intuitive controls.
 - l. Ability to edit, update and create GUI with a drag and drop editor that is cloud based.
 - m. Verify size and location of touch monitor on the AV drawings.

1.03 QUALITY ASSURANCE

- A. Integrator's Qualifications:
- 1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.

2. The Contractor qualifications are specified in Section 27 41 00, 1.07, CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters
 - b. UL - Underwriters Laboratories
 - c. EIA - Electrical Industries Association
 - d. NEC - National Electrical Code
- C. Prior to installation of cables, conductors or connectors, submittal of shop drawings must be approved by contracting office as described in Section 27 41 00, 1.10.
- D. Touch Screen Software Development Meetings:
1. Conduct a development meeting with the Architect and Owner users to develop an operation manual for the system and to gain approval for proposed GUI software functions and screens.
 - a. Meeting: Meet with the Architect and Owner users at current courts to ascertain through discussion and observation how each court currently operates and what audio-visual system equipment is currently in use. Help Owner users understand the functions, features, and modes of the new audio-visual system described herein. Demonstrate the software and screens from other systems as necessary to gain user understanding. Prepare and submit minutes of this meeting.
 - b. Review: Provide copies of the initial draft operation manuals and initial GUI screen submittals. Meet with the Architect and Owner users to present each initial submittal to the Owner and to hear their initial review comments. Prepare and submit minutes of this meeting.
 - c. Follow-up Review: Meet with the Architect and Owner users to present revised draft operations manual and screen submittals. Incorporate any Owner comments into the screen demonstrations at the Shop Testing.
- E. Draft Operation Manuals and Screen Submittals:
1. Draft Operations Manual: Condense the operational narratives and sequences that will be included in the final Operations Manual into bullet points and topic sentences to concisely convey essentials of audio-visual system operation.
 2. Screen Submittals: Full-size, color graphics of each GUI screen.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words "or equal product meeting the performance requirements of this Section".
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
1. Satisfaction of all performance data listed in this Section.

2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Typical Courtroom
1. JAVS Suite 8, JAVS AutoLog 8, JAVS Publisher 8, JAVS Scheduler 8 software.
 2. Kramer Physical Brain with I/O and BRAINware
 3. Kramer SL-240C Room Controller
 4. Kramer KT-107 or KT-1010 Touch panel
 5. Substitutions: See Section 01 60 0 - Product Requirements.
- D. Multi-Purpose Room
1. JAVS Suite 8, JAVS AutoLog 8, JAVS Publisher 8, JAVS Scheduler 8 software.
 2. Kramer Physical Brain with I/O and BRAINware
 3. Kramer SL-240C Room Controller
 4. Kramer KT-107 or KT-1010 Touch panel
 5. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Supply completely assembled and fully tested Integrated Control System for Audio Visual Systems for each audio-visual system, to the extent that such items are not provided by others.
- B. Follow and submit results of commissioning protocol procedures as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- C. Secure equipment firmly in place including cables. Make fastenings and supports adequate to support their loads with a minimum design load factor of five.
- D. Install work neatly, with boxes, equipment, etc. plumb and square. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain same supervisor throughout the execution of the work unless circumstances beyond the control of the Contractor. Install the system in cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- E. Clearly, logically, and permanently mark switches, connectors, jacks, receptacles, cables and cable terminations.
- F. Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.
- G. Provide all cables necessary for interconnection of equipment. Use terminations required to achieve full function of equipment as specified herein.
- H. On completion, remove all rubbish and unused materials from the premises and clean the premises and all equipment where dirtied by removing all dirt, dust, stains and fingerprints.

3.02 TESTING AND DEMONSTRATION

- A. Complete satisfactory testing as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- B. Upon approval of the test report by the Architect, and at a time established by the Architect, demonstrate the operation of each major component of the system and the completed installation. After demonstration, assist as required in the following acceptance tests:

1. Listening Tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.
 2. Viewing Tests: Include analysis of system color rendition, resolution and subjective visual evaluation by observers and various operating conditions, using program, test and live material.
 3. Equipment Tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.
- C. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of the specifications.

3.03 DOCUMENTATION

- A. As-Built Drawings: The Contractor shall supply reproducible full size "As-Built Drawings" showing the final installation of the system including all changes which were made during fabrication and installation.
- B. Maintenance Information:
1. The Contractor shall provide technical information for all electronic apparatus, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions and technical specifications.
 2. The Contractor submittal shall include all shop drawings prepared and used by the Contractor, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.
- C. Instruction Manuals: Provide five (5) copies of an Instruction Manual to the Architect containing the following:
1. Table of Contents
 2. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.
 3. List of settings and adjustments for semi-fixed controls.
 4. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

3.04 TRAINING AND INSTRUCTION

- A. A minimum of ten (10) hours of training shall be provided by the Contractor to designated Owner representatives, at a time mutually agreed upon between Owner and Contractor. Contractor shall notify Architect of date and time established for training and instruction.
- B. Training shall be structured as a "train the trainer" format providing all the information necessary to train additional staff members.
- C. Training and instruction shall be provided in the presence of the Architect, however, this condition may be waived at the Architect 's discretion.
- D. During the training, the participants shall be given opportunities for "hands-on" experience with operating the controls. There shall be audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the A/V systems shall be designated by the Owner.
- E. The Contractor shall provide the necessary equipment to record both the audio and video of the system training on a standard DVD recording medium. The Contractor shall record the training session for each type of room and provide two copies of the DVD to the Owner.

END OF SECTION

This page intentionally left blank

**SECTION 27 41 30
VIDEO FOR AUDIO VISUAL SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY**

- A. Typical Courtroom
- B. Multi-Purpose Room
- C. Jury Deliberation Room
- D. Secured Conference Room

1.02 SECTION 274170 – PAGING SYSTEM FOR WHOLE BUILDING**1.03 DESCRIPTION OF WORK**

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems.

1.04 TYPICAL COURTROOM

- 1. Refer to the AV drawings for locations and quantities of Typical Courtrooms and equipment layout.
- 2. The Typical Courtrooms shall include five (5) High-Definition video cameras integrated into the audio-visual system to capture the proceedings.
 - a. Provide the quantity and mounting style of cameras shown on the drawings and feed to the A/V processor in the equipment rack.
 - b. Each camera to utilize a single 1 RG6 and a single 18 gauge pair for, Genlock, Power, and Control.
 - c. Compact and unobtrusive size with total resolution of up to 1080P 1920x1080@60fps.
 - d. Shall have 1/2.8" 2.0 Megapixel CMOS image sensor with 0.1 Lux/f1.2 light sensitivity.
 - e. Each camera shall include auto tracking white balance and back light compensation.
 - f. Each camera shall include external VBS synchronization to allow for multiple cameras to be line locked and switched with an external video switcher.
 - g. Lenses: Provide to capture the field of view as shown on the drawings.
 - h. Each camera shall switch automatically to the active speaker as integrated with the audio for the audio-visual systems. Voice activated automatic switching that can be configured through the integrated control system for the audio-visual system.
 - i. IP digital cameras will not be accepted.
- 3. The Typical Courtrooms shall have a dedicated control pc that is an intelligent audio video DSP to manage all audio and video requirements of the room.
 - a. Shall be software configurable.
 - b. Shall have a self-test start up to verify all microphone are operating properly and can be initiated at any time.
 - c. Shall include on screen identification of active microphone, date and time stamp and owner configurable information display.
 - d. Shall have customizable voice announcements to provide audio indication of record activity to all connected parties.

4. The Typical Courtrooms shall have a scalable High-Definition Digital Video Switchers that integrates with the intelligent audio video processor.
 - a. Digital video switcher shall manage and route all digital video sources within the courtroom and for outputs.
 - b. Shall have a minimum 12 Input/Output (8 HD-SDI/4 HDMI) capability.
 - c. Digital video switcher shall have smooth switching activity through programmable parameters for both input qualification time and hold time. Both parameters shall be adjustable from 0 to 25.5 seconds in 0.1 second increments to prevent false triggering or jumpiness in the video as it attempts to follow a conversation.
 5. The Typical Courtrooms shall have a switching video mix available on LAN stream to local network authorized users. Operator shall have the ability to mute streamed media with the integrated control system for audio visual systems.
 6. The Typical Courtrooms shall include two (2) tilt mounted wall mounted 86" LCD flat panel monitors and one (1) 22" LCD viewing monitor at the bench and witness locations.
 7. The Typical Courtrooms shall include a single stand-alone wireless presentation system integrated with the system and monitors.
 - a. Easy Plug and Play Connection
 - b. Up to four participant screens can be displayed simultaneously on main screen.
 - c. Shall not require any software or configuration for presentation on the monitor.
 - d. Security features shall include user authentication, 1024-bit encryption, dynamic room code
 - e. Shall play audio on monitor speakers if any audio present on material participant is presenting.
 8. The Typical Courtrooms shall include video conferencing integration with the audio-visual system.
 - a. The remote side shall be able to see and hear an automatic switch of the proceedings within the hearing room or a combination of one (1) to three (3) cameras with all audio from the near side in a configuration selected by the user.
 - b. The audio and video from the far end shall be seen on the monitors within the room and heard over the speaker system.
 9. The Typical Courtrooms shall include web conferencing integration with the audio-visual system.
 - a. Ability to connection Teams or Zoom to the integrated audio-visual system.
 - b. The remote side shall be able to see and hear an automatic switch of the proceedings within the hearing room or a combination of one (1) to three (3) cameras with all audio from the near side in a configuration selected by the user.
 - c. The audio-visual system operator shall be able to initiate a web-based video conference from the owner provided workstation.
 - d. The audio and video from the far end shall be seen on the monitors within the room and heard over the speaker system.
 10. The Typical Courtrooms shall have the ability to connect to the secured conference room, room 226.
- B. Multi-Purpose Room
1. Refer to the AV drawings for locations and quantities of Multi-Purpose Room equipment layout.
 2. The Multi-Purpose Room shall include five (5) High-Definition video cameras integrated into the audio-visual system to capture the proceedings.
 - a. Provide the quantity and mounting style of cameras shown on the drawings and feed to the A/V processor in the equipment rack.
 - b. Each camera to utilize a single 1 RG6 and a single 18 gauge pair for, Genlock, Power, and Control.
 - c. Compact and unobtrusive size with total resolution of up to 1080P 1920x1080@60fps.
 - d. Shall have 1/2.8" 2.0 Megapixel CMOS image sensor with 0.1 Lux/f1.2 light sensitivity.
 - e. Each camera shall include auto tracking white balance and back light compensation.

- f. Each camera shall include external VBS synchronization to allow for multiple cameras to be line locked and switched with an external video switcher.
 - g. Lenses: Provide to capture the field of view as shown on the drawings.
 - h. Each camera shall switch automatically to the active speaker as integrated with the audio for the audio-visual systems. Voice activated automatic switching that can be configured through the integrated control system for the audio-visual system.
 - i. IP digital cameras will not be accepted.
- 3. The Multi-Purpose Room shall have a dedicated control pc that is an intelligent audio video DSP to manage all audio and video requirements of the room.
 - a. Shall be software configurable.
 - b. Shall have a self-test start up to verify all microphone are operating properly and can be initiated at any time.
 - c. Shall include on screen identification of active microphone, date and time stamp and owner configurable information display.
 - d. Shall have customizable voice announcements to provide audio indication of record activity to all connected parties.
- 4. The Multi-Purpose Room shall have a scalable High-Definition Digital Video Switchers that integrates with the intelligent audio video processor.
 - a. Digital video switcher shall manage and route all digital video sources within the courtroom and for outputs.
 - b. Shall have a minimum 12 Input/Output (8 HD-SDI/4 HDMI) capability.
 - c. Digital video switcher shall have smooth switching activity through programmable parameters for both input qualification time and hold time. Both parameters shall be adjustable from 0 to 25.5 seconds in 0.1 second increments to prevent false triggering or jumpiness in the video as it attempts to follow a conversation.
- 5. The Multi-Purpose Room shall have a switching video mix available on LAN stream to local network authorized users. Operator shall have the ability to mute streamed media with the integrated control system for audio visual systems.
- 6. The Multi-Purpose Room shall include two (2) tilt mounted wall mounted 86" LCD flat panel monitor, and three (2) 22" LCD viewing monitors at the bench.
- 7. The Multi-Purpose Room shall include a single stand-alone wireless presentation system integrated with the system and monitors.
 - a. Easy Plug and Play Connection
 - b. Up to four participant screens can be displayed simultaneously on main screen.
 - c. Shall not require any software or configuration for presentation on the monitor.
 - d. Security features shall include user authentication, 1024-bit encryption, dynamic room code
 - e. Shall play audio on monitor speakers if any audio present on material participant is presenting.
- 8. The Multi-Purpose Room shall include video conferencing integration with the audio-visual system.
 - a. The remote side shall be able to see and hear an automatic switch of the proceedings within the hearing room or a combination of one (1) to three (3) cameras with all audio from the near side in a configuration selected by the user.
 - b. The audio and video from the far end shall be seen on the monitors within the room and heard over the speaker system.
- 9. The Multi-Purpose Room shall include web conferencing integration with the audio-visual system.
 - a. Ability to connection Teams or Zoom to the integrated audio-visual system.
 - b. The remote side shall be able to see and hear an automatic switch of the proceedings within the hearing room or a combination of one (1) to three (3) cameras with all audio from the near side in a configuration selected by the user.
 - c. The audio-visual system operator shall be able to initiate a web-based video conference from the owner provided workstation.

- d. The audio and video from the far end shall be seen on the monitors within the room and heard over the speaker system.
- C. Jury Deliberation Room
 - 1. Refer to the AV drawings for locations and quantities of Jury Deliberation Room and equipment layout.
 - 2. The Jury Deliberation Room shall include one (1) wall mounted 65" LCD flat panel monitor.
 - a. Tilt mounted.
 - b. LCD flat panel shall include integrated dual built-in 10W speakers.
 - c. UHD (3840 x 2160) Native Resolution
 - d. 1200:1 Contrast Ratio
 - e. Built-In Ethernet Connectivity
 - f. Built-In Digital Tuner
 - g. Inputs shall include 1x Component Video, 1x USB, and 3x HDMI
 - 3. The Jury Deliberation Room shall include a single stand-alone wireless presentation system integrated with the wall mounted flat panel monitor.
 - a. Easy Plug and Play Connection
 - b. Up to four participant screens can be displayed simultaneously on main screen.
 - c. Shall not require any software or configuration for presentation on the monitor.
 - d. Security features shall include user authentication, 1024-bit encryption, dynamic room code
 - e. Shall play audio on monitor speakers if any audio present on material participant is presenting.
- D. Secured Conference Room - Room 226A
 - 1. Refer to the AV drawings for locations and quantities of Secured Conference Room and equipment layout.
 - 2. The Secured Conference Room shall include one (1) wall mounted secure enclosure with monitor, speaker, camera, and microphone.
 - a. 24" LCD flat panel monitor.
 - 3. The Secured Conference Room shall be able to connect to either Typical Courtroom or other outside locations.
 - a. Connection will be completed with a Polycom X50 video conference unit.
 - 4. Audio and video from the Secured Conference Room shall integrate into the Typical Courtroom Systems.
 - 5. Participants in the Secured Conference Room shall see a switching video feed from the Typical Courtrooms and hear a mix of all microphones.

1.05 QUALITY ASSURANCE

- A. Integrator's Qualifications:
 - 1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.
 - 2. The Contractor qualifications are specified in Section 274100, article 6. CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
 - 1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters
 - b. UL - Underwriters Laboratories
 - c. EIA - Electrical Industries Association
 - d. NEC - National Electrical Code
- C. Prior to installation of cables, conductors or connectors, submittal of shop drawings must be approved by contracting office as described in Section 274100, article 9.
- D. Shop Testing

1. Fabricate and assemble racks off-site for inspection and testing prior to shipment to site for installation. After fabrication, assembly, integration, programming, and pre-testing of each courtroom rack, integrate racks together as a network.
2. Perform a shop test of those assemblies and equipment functioning as a single, fully integrated system. Accomplish the goal of pre-testing and confirming the correct functionality and performance of every system function, duplicating site configuration and conditions to the greatest degree practical, so that the only element untested in the shop is the field wiring.
3. Shop testing shall be a major milestone that shall commence only after all shop assembly, system integration and software development is complete. Architect's approval of the integrated factory test shall be obtained before the shipment of any system components to the site for installation.
4. Notify the Architect a minimum of 15 calendar days prior to shop testing so that arrangements may be made to witness testing.
5. Conduct tests in strict accordance with the approved test procedures. Demonstrate full compliance with the required operating modes and sequences of operation.
6. If test results are not in compliance with requirements, make necessary changes, corrections, repairs, or adjustments at no additional cost and arrange for another shop test. This process shall continue until the systems are acceptable to the Architect.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words "or equal product meeting the performance requirements of this Section".
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
 1. Satisfaction of all performance data listed in this Section.
 2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Typical Courtroom
 1. Sharp or LG Monitor
 2. Chief LTM1U
 3. Kramer Electronics VIA Connect PRO
 4. Kramer Electronics VIA Pad
 5. JAVS JC-20HD
 6. JAVS AXIO AV Processor
 7. JAVS VARIA Video Switcher
 8. Vaddio AV Bridge
 9. Poylcom Group 500
 10. Osprey MVS-3
 11. Blackmagic BMD-VHUBSMTCS6G1212

12. Substitutions: See Section 01 60 0 - Product Requirements.
- D. Multi-Purpose Room
 1. Sharp or LG Monitor
 2. Chief LTM1U
 3. Kramer Electronics VIA Connect PRO
 4. Kramer Electronics VIA Pad
 5. JAVS JC-20HD
 6. JAVS AXIO AV Processor
 7. JAVS VARIA Video Switcher
 8. Vaddio AV Bridge
 9. Poylcom Group 500
 10. Osprey MVS-3
 11. Blackmagic BMD-VHUBSMTCS6G1212
 - 12.
- E. Jury Deliberation Room
 1. Sharp or LG Monitor
 2. Chief LTM1U
 3. Kramer Electronics VIA Connect PRO
 4. Kramer Electronics VIA Pad
 5. Secured Conference Room
 6. KCG,LLC Secured Enclosure
 7. Sharp or LG Monitor
 8. Polycom X50
 9. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Supply completely assembled and fully tested Video for Audio Visual Systems for each audio-visual system, to the extent that such items are not provided by others.
- B. Follow and submit results of commissioning protocol procedures as described in Section 274100 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- C. Secure equipment firmly in place including cables. Make fastenings and supports adequate to support their loads with a minimum design load factor of five.
- D. Install work neatly, with boxes, equipment, etc. plumb and square. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain same supervisor throughout the execution of the work unless circumstances beyond the control of the Contractor. Install the system in cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- E. Clearly, logically, and permanently mark switches, connectors, jacks, receptacles, cables and cable terminations.
- F. Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.
- G. Provide all cables necessary for interconnection of equipment. Use terminations required to achieve full function of equipment as specified herein.
- H. On completion, remove all rubbish and unused materials from the premises and clean the premises and all equipment where dirtied by removing all dirt, dust, stains and fingerprints.

3.02 TESTING AND DEMONSTRATION

- A. Complete satisfactory testing as described in Section 274100 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- B. Upon approval of the test report by the Architect, and at a time established by the Architect, demonstrate the operation of each major component of the system and the completed installation. After demonstration, assist as required in the following acceptance tests:
 - 1. Listening Tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.
 - 2. Viewing Tests: Include analysis of system color rendition, resolution and subjective visual evaluation by observers and various operating conditions, using program, test, and live material.
 - 3. Equipment Tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.
- C. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of the specifications.

3.03 DOCUMENTATION

- A. As-Built Drawings: The Contractor shall supply reproducible full size "As-Built Drawings" showing the final installation of the system including all changes which were made during fabrication and installation.
- B. Maintenance Information:
 - 1. The Contractor shall provide technical information for all electronic apparatus, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions, and technical specifications.
 - 2. The Contractor submittal shall include all shop drawings prepared and used by the Contractor, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.
- C. Instruction Manuals: Provide five (5) copies of an Instruction Manual to the Architect containing the following:
 - 1. Table of Contents
 - 2. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.
 - 3. List of settings and adjustments for semi-fixed controls.
 - 4. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

3.04 TRAINING AND INSTRUCTION

- A. A minimum of ten (10) hours of training shall be provided by the Contractor to designated Owner representatives, at a time mutually agreed upon between Owner and Contractor. Contractor shall notify Architect of date and time established for training and instruction.
- B. Training shall be structured as a "train the trainer" format providing all the information necessary to train additional staff members.
- C. Training and instruction shall be provided in the presence of the Architect, however, this condition may be waived at the Architect's discretion.
- D. During the training, the participants shall be given opportunities for "hands-on" experience with operating the controls. There shall be audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the A/V systems shall be designated by the Owner.

- E. The Contractor shall provide the necessary equipment to record both the audio and video of the system training on a standard DVD recording medium. The Contractor shall record the training session for each type of room and provide two copies of the DVD to the Owner.

END OF SECTION

SECTION 27 41 40
AUDIO FOR AUDIO VISUAL SYSTEMS**PART 1 - GENERAL****1.01 SUMMARY**

- A. Typical Courtroom
- B. Multi-Purpose Room
- C. Secured Conference Room

1.02 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems.
- E. Audio for the audio-visual system shall integrate with the video of the audio-visual system as described in the related sections.
- F. Typical Courtroom
 - 1. Refer to the AV drawings for locations and quantities for Typical Courtroom equipment layout.
 - 2. The Typical Courtroom shall have a scalable intelligent audio video processor to manage all audio and video requirements of the room as described in Section 27 41 30 – Video for Audio Visual Systems. Additional audio features shall include:
 - a. Automatic microphone mixing using a proportional gain algorithm allows for greatly increased intelligibility and gain before feedback.
 - b. Features such as Sharp Noise Rejection and Dynamic Adaptive Threshold required to ensure high quality audio capture without distractive ambient noise.
 - c. Shall have up to 16 discrete audio channels.
 - d. Shall have 20 microphone inputs and 4 auxiliary audio inputs.
 - e. Shall have 20 AEC configurable audio outputs.
 - f. Shall have a minimum of 4x4 Dante for networked audio applications.
 - g. Provides customizable voice Announcements to provide audio indication of record activity to all connected parties.
 - h. Self-Test Startup to verify all components and devices are operating properly. Self-test shall be initiated at any time and prompts users when errors occur.
 - i. Ability to create endless number of Public and Private modes to adjust and change the requirements or configurations of the microphones
 - 3. The Typical Courtroom shall have eight (8) microphones to capture the speaker's voice of the proceedings.
 - a. Goose neck microphones will not be accepted.
 - b. Boundary style microphone with six (6) programmable pick-up patterns. Patterns to include Omnidirectional, Subcardiod, Cardioid, Supercardioid, Hypercardioid, and Bidirectional.
 - c. Each microphone shall be software configurable with the integrated control system for the audio-visual system. Configuration shall include the ability to change pick up pattern and adjust levels.

- d. Each microphone shall have a software configurable touch capacitive programmable push button for Push Once to Talk, Hold to Talk, Push Once to Mute, or Hold to Mute.
- 4. Audio mix shall be available on LAN stream to local network authorized users. Judge shall have the ability to mute streamed media with the integrated control system for audio visual systems.
- 5. The Typical Courtroom shall have ceiling mounted speakers to provide ample voice lift for participants in the room.
 - a. Verify speaker locations and quantities on the AV drawings.
 - b. Recessed mounted.
 - c. Equip with 25V, 8-watt multi-tapped transformer. Coordinate back box and grilles as required.
 - d. These speakers shall be zoned to provide control of sound levels.
- 6. The Typical Courtroom shall have a single two (2) channel power amplifier with 40W per channel with 70V & 100V Speaker Outputs.
- 7. Provide audio processing equipment for dual channel advanced feedback suppression.
 - a. Twenty-four (24) programmable filters per channel with stereo or dual independent channel processing.
 - b. Live and fixed filter modes.
- 8. Audio from selected A/V processor source shall be heard over the ceiling speakers when source is displayed on the courtroom monitor(s). Includes audio from presented materials, audio from remote side of video web conference, audio from remote side of teleconference.
- 9. Mix of microphone audio shall be heard over the ceiling speakers.
- 10. Audio from selected A/V processor source shall be heard over the monitor speakers when source is displayed on the courtroom monitor(s). Includes audio from presented materials, audio from remote side of video web conference, audio from remote side of teleconference. No local microphone audio is to be heard on the monitor(s).
- 11. Judge shall have the ability to activate white or pink noise over the ceiling speakers with the integrated control system for audio visual systems.
 - a. When activated during a web conference or teleconference, remote side will not hear white or pink noise, only a muted feed from the court side.
- 12. The Typical Courtroom shall include an integrated assisted listening system with a wall mounted infrared emitter panel.
 - a. The A/V processor will send a line level signal to the infrared assistive listening system.
 - b. System shall mute audio during bench conference and private sidebar conversations.
 - c. System to perform as required by the ADAAG 706.2 requirements including but not limited to, compatibility with telcoils in hearing aids through the provision of neckloops.
 - d. System shall include:
 - 1) (1) MOD 232 modulator
 - 2) (1) WIR TX9 DC emitter (with TFP 053 U.S. DC power supply)
 - 3) (1) BKT 024 wall / ceiling mount
 - 4) (3) WIR RX18 receivers
 - 5) (1) WIR RX22-4 receiver
 - 6) (1) EAR 022 earphone
 - 7) (1) CHG 518 five-bay charger
 - 8) (1) NKL 001 neckloop
 - 9) (1) RPK 005 rack mount kit
 - 10) (2) BAT 001 AA alkaline batteries
 - 11) (1) IDP 008 ADA wall plaque
- 13. The Typical Courtroom room shall include an integrated digital telephone hybrid unit at each rack and will be connected to the telephone line to allow outside phone-in testimony. Coordinate the installation of voice/data/jacks with telephone lines at each rack.
 - a. Audio from remote phone-in will be mixed in with the local audio and broadcast over the room speakers.
 - b. Remote side will hear a mix-minus audio feed to help eliminate feedback.

G. Multi-Purpose Room

1. Refer to the AV drawings for locations and quantities for Multi-Purpose Room equipment layout.
2. The Multi-Purpose Room shall have a scalable intelligent audio video processor to manage all audio and video requirements of the room as described in Section 27 41 30 – Video for Audio Visual Systems. Additional audio features shall include:
 - a. Automatic microphone mixing using a proportional gain algorithm allows for greatly increased intelligibility and gain before feedback.
 - b. Features such as Sharp Noise Rejection and Dynamic Adaptive Threshold required to ensure high quality audio capture without distractive ambient noise.
 - c. Shall have up to 16 discrete audio channels.
 - d. Shall have 20 microphone inputs and 4 auxiliary audio inputs.
 - e. Shall have 20 AEC configurable audio outputs.
 - f. Shall have a minimum of 4x4 Dante for networked audio applications.
 - g. Provides customizable voice Announcements to provide audio indication of record activity to all connected parties.
 - h. Self-Test Startup to verify all components and devices are operating properly. Self-test shall be initiated at any time and prompts users when errors occur.
 - i. Ability to create endless number of Public and Private modes to adjust and change the requirements or configurations or the microphones
3. The Multi-Purpose Room shall have eight (8) microphones to capture the speaker's voice of the proceedings.
 - a. Goose neck microphones will not be accepted.
 - b. Boundary style microphone with six (6) programmable pick-up patterns. Patterns to include Omnidirectional, Subcardiod, Cardioid, Supercardioid, Hypercardioid, and Bidirectional.
 - c. Each microphone shall be software configurable with the integrated control system for the audio-visual system. Configuration shall include the ability to change pick up pattern and adjust levels.
 - d. Each microphone shall have a software configurable touch capacitive programmable push button for Push Once to Talk, Hold to Talk, Push Once to Mute, or Hold to Mute.
4. The Multi-Purpose Room shall have ceiling mounted speakers to provide ample voice lift for participants in the room.
 - a. Verify speaker locations and quantities on the AV drawings.
 - b. Recessed mounted.
 - c. Equip with 25V, 8-watt multi-tapped transformer. Coordinate back box and grilles as required.
 - d. These speakers shall be zoned to provide control of sound levels.
5. The Multi-Purpose Room shall have a single two (2) channel power amplifier with 40W per channel with 70V & 100V Speaker Outputs.
6. Provide audio processing equipment for dual channel advanced feedback suppression.
 - a. Twenty-four (24) programmable filters per channel with stereo or dual independent channel processing.
 - b. Live and fixed filter modes.
7. Audio from selected A/V processor source shall be heard over the ceiling speakers when source is displayed on the courtroom monitor(s). Includes audio from presented materials, audio from remote side of video web conference, audio from remote side of teleconference.
8. Mix of microphone audio shall be heard over the ceiling speakers.
9. Audio from selected A/V processor source shall be heard over the monitor speakers when source is displayed on the courtroom monitor(s). Includes audio from presented materials, audio from remote side of video web conference, audio from remote side of teleconference. No local microphone audio is to be heard on the monitor(s).
10. Judge shall have the ability to activate white or pink noise over the ceiling speakers with the integrated control system for audio visual systems.

- a. When activated during a web conference or teleconference, remote side will not hear white or pink noise, only a muted feed from the court side.
 11. Audio mix shall be available on LAN stream to local network authorized users. Judge shall have the ability to mute streamed media with the integrated control system for audio visual systems.
 12. The Multi-Purpose Room shall include an integrated assisted listening system with a wall mounted infrared emitter panel.
 - a. The A/V processor will send a line level signal to the infrared assistive listening system.
 - b. System shall mute audio during bench conference and private sidebar conversations.
 - c. System to perform as required by the ADAAG 706.2 requirements including but not limited to, compatibility with telcoils in hearing aids through the provision of neckloops.
 - d. System shall include:
 - 1) (1) MOD 232 modulator
 - 2) (1) WIR TX9 DC emitter (with TFP 053 U.S. DC power supply)
 - 3) (1) BKT 024 wall / ceiling mount
 - 4) (3) WIR RX18 receivers
 - 5) (1) WIR RX22-4 receiver
 - 6) (1) EAR 022 earphone
 - 7) (1) CHG 518 five-bay charger
 - 8) (1) NKL 001 neckloop
 - 9) (1) RPK 005 rack mount kit
 - 10) (2) BAT 001 AA alkaline batteries
 - 11) (1) IDP 008 ADA wall plaque
 13. The Multi-Purpose Room shall include an integrated digital telephone hybrid unit at each rack and will be connected to the telephone line to allow outside phone-in testimony. Coordinate the installation of voice/data/jacks telephone lines at each rack.
 - a. Audio from remote phone-in will be mixed in with the local audio and broadcast over the room speakers.
 - b. Remote side will hear a mix-minus audio feed to help eliminate feedback.
- H. Secured Conference Room
1. Refer to the AV drawings for locations and quantities of Secured Conference Room and equipment layout.
 2. The Secured Conference Room shall include one (1) wall mounted secure enclosure with monitor, speaker, camera, and microphone.
 - a. a 24" LCD flat panel monitor.
 3. The Secured Conference Room shall be able to connect to either Typical Courtroom or other outside locations.
 - a. Connection will be completed with a Polycom X50 video conference unit.
 4. Audio and video from the Secured Conference Room shall integrate into the Typical Courtroom Systems.
 5. Participants in the Secured Conference Room shall see a switching video feed from the Typical Courtrooms and hear a mix of all microphones.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words "or equal product meeting the performance requirements of this Section".
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
 - 1. Satisfaction of all performance data listed in this Section.
 - 2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 - 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Typical Courtroom
 - 1. JAVS AXIO AV Processor
 - 2. JAVS Flexmicrophone
 - 3. Lowell Manufacturing WB4T-4A30-T870
 - 4. Lowell Manufacturing DX104-T
 - 5. JBL CSA 240Z
 - 6. DBX AFS2
 - 7. Williams Sound WIR SYS 3
 - 8. JK Audio INNKEEPER
 - 9. Substitutions: See Section 01 60 0 - Product Requirements.
- D. Multi-Purpose Room
 - 1. JAVS AXIO AV Processor
 - 2. JAVS Flexmicrophone
 - 3. Lowell Manufacturing WB4T-4A30-T870
 - 4. Substitutions: See Section 01 60 0 - Product Requirements.
- E. Lowell Manufacturing DX104-T
 - 1. JBL CSA 240Z
 - 2. DBX AFS2
 - 3. Williams Sound WIR SYS 3
 - 4. JK Audio INNKEEPER
 - 5. Substitutions: See Section 01 60 0 - Product Requirements.
- F. Secured Conference Room
 - 1. KCG,LLC Secured Enclosure
 - 2. Sharp or LG Monitor
 - 3. Polycom X50
 - 4. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. Supply completely assembled and fully tested Audio for Audio Visual Systems for each audio-visual system, to the extent that such items are not provided by others.
- B. Follow and submit results of commissioning protocol procedures as described in Section 274100 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- C. Secure equipment firmly in place including cables. Make fastenings and supports adequate to support their loads with a minimum design load factor of five.
- D. Install work neatly, with boxes, equipment, etc. plumb and square. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain same supervisor throughout the execution of the work unless circumstances beyond the control of the Contractor. Install the system in

cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.

- E. Clearly, logically, and permanently mark switches, connectors, jacks, receptacles, cables and cable terminations.
- F. Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.
- G. Provide all cables necessary for interconnection of equipment. Use terminations required to achieve full function of equipment as specified herein.
- H. On completion, remove all rubbish and unused materials from the premises and clean the premises and all equipment where dirtied by removing all dirt, dust, stains, and fingerprints.

3.02 TESTING AND DEMONSTRATION

- A. Complete satisfactory testing as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- B. Upon approval of the test report by the Architect, and at a time established by the Architect, demonstrate the operation of each major component of the system and the completed installation. After demonstration, assist as required in the following acceptance tests:
 - 1. Listening Tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.
 - 2. Viewing Tests: Include analysis of system color rendition, resolution and subjective visual evaluation by observers and various operating conditions, using program, test and live material.
 - 3. Equipment Tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.
- C. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of the specifications.

3.03 DOCUMENTATION

- A. As-Built Drawings: The Contractor shall supply reproducible full size "As-Built Drawings" showing the final installation of the system including all changes which were made during fabrication and installation.
- B. Maintenance Information:
 - 1. The Contractor shall provide technical information for all electronic apparatus, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions and technical specifications.
 - 2. The Contractor submittal shall include all shop drawings prepared and used by the Contractor, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.
- C. Instruction Manuals: Provide five (5) copies of an Instruction Manual to the Architect containing the following:
 - 1. Table of Contents
 - 2. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.
 - 3. List of settings and adjustments for semi-fixed controls.
 - 4. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

3.04 TRAINING AND INSTRUCTION

- A. A minimum of ten (10) hours of training shall be provided by the Contractor to designated Owner representatives, at a time mutually agreed upon between Owner and Contractor. Contractor shall notify Architect of date and time established for training and instruction.
- B. Training shall be structured as a "train the trainer" format providing all the information necessary to train additional staff members.
- C. Training and instruction shall be provided in the presence of the Architect, however, this condition may be waived at the Architect's discretion.
- D. During the training, the participants shall be given opportunities for "hands-on" experience with operating the controls. There shall be audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the A/V systems shall be designated by the Owner.
- E. The Contractor shall provide the necessary equipment to record both the audio and video of the system training on a standard DVD recording medium. The Contractor shall record the training session for each type of room and provide two copies of the DVD to the Owner.

END OF SECTION

This page intentionally left blank

SECTION 27 41 60
DIGITAL RECORDING FOR AUDIO VISUAL SYSTEMS

PART 1 - GENERAL**1.01 SUMMARY**

- A. Digital Recording

1.02 DESCRIPTION OF WORK

- A. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- B. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- C. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- D. Coordinate all grounding with electrical. Refer to Section 27 41 04 – Grounding and Bonding for Audio Visual Systems.
- E. Audio for the audio-visual system shall integrate with the video of the audio visual system as described in the related sections.
- F. Digital Recording for Jury and Typical Courtroom
1. Refer to the AV drawings for locations and quantities of room types.
 2. Each Typical Courtroom and Multi-Purpose Room shall include two (2) dedicated digital recording appliances.
 - a. Primary Recorder: Capturing five (5) isolated audio tracks and a single switching video track.
 - b. Secondary Recorder: Capturing five (5) isolated audio tracks and a single switching video track.
 3. Digital Recorders shall utilize Microsoft LTSC.
 4. Provide time-stamped annotations that link ODBC-compatible logging data directly with the exact time on the associated audio and video files.
 5. Allow multiple users anywhere on the network the ability to annotate/log the record at the same time.
 6. Shall be a non-proprietary file format and shall be a standard Windows Media format not requiring any special codec for playback on a PC or MAC.
 7. Secure File Transfer Protocol (SFTP) required removing the need for a file share to be enabled on the digital recording appliances, instead requiring a username and password to access files through a secure client.
 8. Shall have scalable resolution and storage configuration.
 - a. 16:9 HD
 - b. 720p
 - c. 1080p
 9. Audio, video and meta data including log notes and hyperlinks shall be in one file not requiring any special software to sync audio and video together.
 10. Digital recording appliances shall capture the video of the selected source of video presentation input as activated on the Integrated Control System for Audio Video Systems and if no source is selected it shall capture a full screen automatic voice activated switching mix of the current active microphone.
 11. Control the recording and playback from Judge's touch monitor on the Integrated Control System.
 12. Control the recording and playback from the owner provided workstation with the digital recording control software including the following functions:

- a. Ability to start/ stop the recording.
 - b. Make log notes with hyperlinks to exact point in the recording.
 - c. Import/create witness and exhibit list.
 - d. Keyword search the recording database.
 - e. Review previous recordings while remaining on the record.
 - f. Seal Sessions and assign Sessions to any Department for added security.
 - g. Search Tool to search any relevant field in the court database to locate information.
 - h. Control audio visual system modes including camera locks and microphone muting with a customizable interface.
13. Front panel LCD control for operation and record status indicator.
 14. Each recording shall be assignable to a specific department, restricting access to the recordings to only users who are members of the assigned department.
 - a. Application programming interface (API) to allow development of software/hardware to integrate with case management system (CMS). With the API, shall be able to push data from the CMS database system into the recording database.
 15. Digital recording appliances shall be stand alone with network capabilities. Shall be able to store up to 4,000 hours locally and shall be able to back up to network archival server.
 16. Reports for the current date, including a summary report, record session log, exhibit report, party report, and a scheduled session report. Advance reports including summary reports, session logs, exhibit reports, and parties reports by date.
 17. Ability to create, edit, move, and delete schedules for any date on the calendar and from any location on the network.
 18. Publishing options to include the ability to publish public information only, both public and private information, include the event log with both public and/or private events and include public notes and/or private notes.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
- B. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- C. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words “or equal product meeting the performance requirements of this Section”.
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
 1. Satisfaction of all performance data listed in this Section.
 2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Digital Recording
 1. JAVS Recorder 8
 2. JAVS Suite 8 Application Software Bundle
 3. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. Supply completely assembled and fully tested Integrated Control System for Audio Visual Systems for each audio-visual system, to the extent that such items are not provided by others.
- B. Follow and submit results of commissioning protocol procedures as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- C. Secure equipment firmly in place including cables. Make fastenings and supports adequate to support their loads with a minimum design load factor of five.
- D. Install work neatly, with boxes, equipment, etc. plumb and square. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain same supervisor throughout the execution of the work unless circumstances beyond the control of the Contractor. Install the system in cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- E. Clearly, logically, and permanently mark switches, connectors, jacks, receptacles, cables, and cable terminations.
- F. Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.
- G. Provide all cables necessary for interconnection of equipment. Use terminations required to achieve full function of equipment as specified herein.

3.02 TESTING AND DEMONSTRATION

- A. Complete satisfactory testing as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, Article 10. COMMISSIONING PROTOCOL PROCEDURES.
- B. Upon approval of the test report by the Architect, and at a time established by the Architect, demonstrate the operation of each major component of the system and the completed installation. After demonstration, assist as required in the following acceptance tests:
 - 1. Listening Tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.
 - 2. Viewing Tests: Include analysis of system color rendition, resolution and subjective visual evaluation by observers and various operating conditions, using program, test, and live material.
 - 3. Equipment Tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.
- C. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of the specifications.

3.03 DOCUMENTATION

- A. As-Built Drawings: The Contractor shall supply reproducible full size "As-Built Drawings" showing the final installation of the system including all changes which were made during fabrication and installation.
- B. Maintenance Information:
 - 1. The Contractor shall provide technical information for all electronic apparatus, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions, and technical specifications.

2. The Contractor submittal shall include all shop drawings prepared and used by the Contractor, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.
- C. Instruction Manuals: Provide five (5) copies of an Instruction Manual to the Architect containing the following:
 1. Table of Contents
 2. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.
 3. List of settings and adjustments for semi-fixed controls.
 4. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

3.04 TRAINING AND INSTRUCTION

- A. A minimum of ten (10) hours of training shall be provided by the Contractor to designated Owner representatives, at a time mutually agreed upon between Owner and Contractor. Contractor shall notify Architect of date and time established for training and instruction.
- B. Training shall be structured as a "train the trainer" format providing all the information necessary to train additional staff members.
- C. Training and instruction shall be provided in the presence of the Architect, however, this condition may be waived at the Architect's discretion.
- D. During the training, the participants shall be given opportunities for "hands-on" experience with operating the controls. There shall be audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the A/V systems shall be designated by the Owner.
- E. The Contractor shall provide the necessary equipment to record both the audio and video of the system training on a standard DVD recording medium. The Contractor shall record the training session for each type of room and provide two copies of the DVD to the Owner.

END OF SECTION

**SECTION 27 41 70
PAGING SYSTEM FOR WHOLE BUILDING****PART 1 GENERAL****1.01 SUMMARY**

- A. Whole Building Paging System

1.02 DESCRIPTION OF WORK

- A. The integrated public address systems within the courtrooms are provided in Section 27 41 40.
- B. The work as described herein shall be furnished and installed by one firm alone. The audio-visual systems Contractor shall furnish and install all equipment and wiring including all necessary cabinets and enclosures for the audio-visual systems described herein.
- C. The work shall be provided complete, and the systems shall be fully operational. The audio-visual system drawings and operational description in this Section and related Sections depict the general intent and detail of the systems.
- D. The specifications and drawings shall be read and used together. In case of conflict between the drawings and specifications, the interpretation of the Architect shall govern. Requests for clarification shall be submitted prior to bid acceptance.
- E. Coordinate all grounding with electrical. Refer to Section 274104 – Grounding and Bonding for Audio Visual Systems.
- F. Paging System
1. Refer to the AV drawings for locations and quantities of speakers in the public area.
 2. Paging system shall allow the user to access the public address speakers from any VOIP phone.
 3. Speakers shall be on one single zone.
 - a. 5.25" 2-Way All Weather Speaker with 30 WATT 70V/100V Transformer.
 - b. Speakers shall be wall mounted.
 4. Paging system shall have five (5) contact outputs can be activated by keypad operation on any phone in the system for paging zone selections or triggering pre-recorded messages.
 5. Paging system shall include a rack mountable easy to configure and operate amplifier.
 - a. 24-bit, 48 kHz sampling.
 - b. Ultra-Low Distortion - 0.0008%.
 - c. Minimum Latency - 1.1ms (D-001T input to output).
 - d. Modular Mixer - up to 8 mic/line inputs and 8 outputs.
 - e. Dual Channel Digital Signal Processor (DSP):
 - f. 10-Band Parametric EQ
 - g. 34 TOA Speaker EQ Presets
 6. Paging microphone with goose neck, base and speaker selector shall be located at the clerk's counter.

1.03 QUALITY ASSURANCE

- A. Integrator's Qualifications:
1. The work of this section along with the related sections will be contracted to a single firm, referred to as the Contractor, for undivided responsibility.
 2. The Contractor qualifications are specified in Section 27 41 00, 1.07, CONTRACTOR QUALIFICATIONS.
- B. Applicable Standards and Codes:
1. In addition to all applicable local and state codes, the work shall be in accordance with the latest revisions of all applicable standards and specifications of the following:
 - a. NAB - National Association of Broadcasters
 - b. UL - Underwriters Laboratories
 - c. EIA - Electrical Industries Association

- d. NEC - National Electrical Code
- C. Prior to installation of cables, conductors or connectors, submittal of shop drawings must be approved by contracting office as described in Section 27 41 00, article 9.
- D. Shop Testing
 - 1. Fabricate and assemble racks off-site for inspection and testing prior to shipment to site for installation. After fabrication, assembly, integration, programming, and pre-testing of each courtroom rack, integrate racks together as a network.
 - 2. Perform a shop test of those assemblies and equipment functioning as a single, fully integrated system. Accomplish the goal of pre-testing and confirming the correct functionality and performance of every system function, duplicating site configuration and conditions to the greatest degree practical, so that the only element untested in the shop is the field wiring.
 - 3. Shop testing shall be a major milestone that shall commence only after all shop assembly, system integration and software development is complete. Architect's approval of the integrated factory test shall be obtained before the shipment of any system components to the site for installation.
 - 4. Notify the Architect a minimum of 15 calendar days prior to shop testing so that arrangements may be made to witness testing.
 - 5. Conduct tests in strict accordance with the approved test procedures. Demonstrate full compliance with the required operating modes and sequences of operation.
 - 6. If test results are not in compliance with requirements, make necessary changes, corrections, repairs, or adjustments at no additional cost and arrange for another shop test. This process shall continue until the systems are acceptable to the Architect.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All materials, equipment, and apparatus shall be new and of the latest design or model offered for sale by the manufacturer.
 - 1. The performance specifications for all materials, equipment, and components shall be as published in the most recent manufacturers' data sheets available at the time of bidding this contract and shall be applicable to the present work as though fully given herein.
- B. Acceptability of materials, equipment, and components not specifically identified herein for use in the audio-visual systems shall be determined by the Architect. Such items shall be installed only after receipt of written approval.

2.02 ACCEPTABLE PRODUCTS

- A. Consider each product named in this section to be followed by the words "or equal product meeting the performance requirements of this Section".
- B. Submit for substitution according to Section 27 41 00 Common Work Results for Audio Visual Systems, SUBMITTAL REQUIREMENTS. Accompany any request for substitution with manufacture-measured data proving the equivalence of the proposed substitute in quality and performance. Substitutions must demonstrate:
 - 1. Satisfaction of all performance data listed in this Section.
 - 2. Performance specifications equivalent to those published in the most recent manufacturers' data sheets available at the time of bidding.
 - 3. The Architect shall be the final Judge of the validity of data submitted.
- C. Public Waiting Area Paging System
 - 1. TOA A-9120DHM2CU.
 - 2. TOA Q-RM9012PS.
 - 3. TOA SP-11N.
 - 4. Atlas IED SM52T-WH.
 - 5. Substitutions: See Section 01 60 0 - Product Requirements.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. Supply completely assembled and fully tested Video for Audio Visual Systems for each audio-visual system, to the extent that such items are not provided by others.
- B. Follow and submit results of commissioning protocol procedures as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- C. Secure equipment firmly in place including cables. Make fastenings and supports adequate to support their loads with a minimum design load factor of five.
 - 1. Install work neatly, with boxes, equipment, etc. plumb and square. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain same supervisor throughout the execution of the work unless circumstances beyond the control of the Contractor. Install the system in cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- D. Clearly, logically, and permanently mark switches, connectors, jacks, receptacles, cables and cable terminations.
- E. Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.
- F. Provide all cables necessary for interconnection of equipment. Use terminations required to achieve full function of equipment as specified herein.
- G. On completion, remove all rubbish and unused materials from the premises and clean the premises and all equipment where dirtied by removing all dirt, dust, stains, and fingerprints.

3.02 TESTING AND DEMONSTRATION

- A. Complete satisfactory testing as described in Section 27 41 00 – Common Work Results for Audio Visual Systems, 1.11, COMMISSIONING PROTOCOL PROCEDURES.
- B. Upon approval of the test report by the Architect, and at a time established by the Architect, demonstrate the operation of each major component of the system and the completed installation. After demonstration, assist as required in the following acceptance tests:
 - 1. Listening Tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.
 - 2. Viewing Tests: Include analysis of system color rendition, resolution and subjective visual evaluation by observers and various operating conditions, using program, test, and live material.
 - 3. Equipment Tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.
- C. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of the specifications.

3.03 DOCUMENTATION

- A. As-Built Drawings: The Contractor shall supply reproducible full size "As-Built Drawings" showing the final installation of the system including all changes which were made during fabrication and installation.
- B. Maintenance Information:

1. The Contractor shall provide technical information for all electronic apparatus, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions, and technical specifications.
 - a. The Contractor submittal shall include all shop drawings prepared and used by the Contractor, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.
- C. Instruction Manuals: Provide five (5) copies of an Instruction Manual to the Architect containing the following:
 1. Table of Contents
 - a. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.
 2. List of settings and adjustments for semi-fixed controls.
 - a. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

3.04 TRAINING AND INSTRUCTION

- A. A minimum of ten (10) hours of training shall be provided by the Contractor to designated Owner representatives, at a time mutually agreed upon between Owner and Contractor. Contractor shall notify Architect of date and time established for training and instruction.
- B. Training shall be structured as a "train the trainer" format providing all the information necessary to train additional staff members.
- C. Training and instruction shall be provided in the presence of the Architect, however, this condition may be waived at the Architect 's discretion.
- D. During the training, the participants shall be given opportunities for "hands-on" experience with operating the controls. There shall be audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the A/V systems shall be designated by the Owner.
- E. The Contractor shall provide the necessary equipment to record both the audio and video of the system training on a standard DVD recording medium. The Contractor shall record the training session for each type of room and provide two copies of the DVD to the Owner.

END OF SECTION

**SECTION 27 51 29.13
RESCUE ASSISTANCE SIGNAL SYSTEMS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Elevator emergency communication system and associated call stations, control stations, and accessories.
 - 1. Includes area of refuge/rescue assistance signage.

1.02 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.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for area of refuge/rescue assistance system components.
 - 2. Coordinate the work with other installers to provide communication lines required for control station timed automatic connection to designated constantly attended monitoring location.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install call stations and control station(s) until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
- C. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.
- D. Design Data: Include standby battery calculations.
- E. Specimen Warranty: Submit sample of manufacturer's warranty.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- G. Manufacturer's certification that products meet or exceed specified requirements.
- H. Operation and Maintenance Data: Include detailed information on system operation, equipment setup, replacement parts, and recommended maintenance procedures and intervals.

1.05 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. ADA Standards.
 - 2. NFPA 70 (National Electrical Code).
 - 3. NFPA 72 (National Fire Alarm and Signaling Code).
 - 4. NFPA 101 (Life Safety Code).
 - 5. The requirements of the local authorities having jurisdiction.
 - 6. Applicable TIA/EIA standards.
- B. Manufacturer Qualifications: Company engaged in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company with minimum three years documented experience with similar area of refuge/rescue assistance systems and providing contract maintenance service as a regular part of their business; manufacturer's authorized installer.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Rescue Assistance Communication System:
 - 1. Cornell Communications: www.cornell.com/#sle.
 - 2. Housing Devices, Inc: www.housingdevices.com/#sle.
 - 3. Rath Microtech: www.area-of-refuge.com/#sle.
 - a. Basis of Design or approved substitution.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Source Limitations: Furnish system components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 RESCUE ASSISTANCE COMMUNICATION SYSTEM

- A. Provide new area of refuge/rescue assistance communication system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. System Description:
 - 1. Call Stations: Located at each designated area of refuge/rescue assistance as indicated on drawings, unless otherwise directed by authorities having jurisdiction.
 - 2. Master Control Station: New, located as indicated on drawings, unless otherwise directed by authorities having jurisdiction.
 - 3. System battery backup is required.
 - 4. Timed automatic connection to designated constantly attended monitoring location is required.
 - 5. Minimum Number of Zones Supported: As required for call stations/zones indicated.
 - 6. Comply with NFPA 72.
- C. System Operation:
 - 1. When a call for assistance is initiated at call station:
 - a. Provide audible and visual notification at call station to confirm that call has been placed.

- b. Provide audible and visual notification at control station(s) that call has been placed and annunciate the location of the call station/zone that initiated a call.
 - c. Maintain visual notification of each call location at control station(s) until manually reset by control station operator.
 - d. Maintain audible notification at control station(s) that call(s) have been placed until call is acknowledged by control station operator.
 - e. Maintain visual notification at call station until manually reset by control station operator.
 - 2. When a call for assistance is acknowledged at control station:
 - a. Provide visual notification at control station that call has been acknowledged.
 - b. Provide visual notification at call station that call has been received.
 - c. Establish two-way voice communication between call station and control station.
 - 3. When a call has not been acknowledged during a programmed time delay to allow for local response, automatically initiate call to listed remote monitoring station under contract with facility, send signal identifying specific building, and establish two-way voice communication.
- D. Call Station(s):
 - 1. Vandal resistant, with tamper proof hardware.
 - 2. Suitable for the environment where installed.
 - 3. Finish: Stainless steel.
 - 4. Mounting: Flush-mounted.
 - 5. Provides means to initiate call for assistance.
 - 6. Provides for distinct audible and visual notification to confirm that call has been placed and for distinct visual notification that call has been acknowledged.
 - 7. Following initial call for assistance, provides for hands-free two-way communication with control station(s).
 - 8. Product(s):
 - a. Rath 2100-958SSRC2 Basis of Design or approved substitution..
- E. Control Station(s):
 - 1. Suitable for the environment where installed.
 - 2. Mounting: Flush-mounted.
 - 3. Provides visual notification that system is operational.
 - 4. Provides for distinct audible and visual notification of calls with annunciation of call station/zone locations.
 - 5. Provides for two-way communication with selected call stations.
 - 6. Provides for supervision of system wiring and provides distinct audible and visual notification of faults.
 - 7. Audible Notification Sound Level: Not less than 90 dB.
 - 8. Product(s):
 - a. Rath 2500-205FM Basis of Design or approved substitution.
- F. Accessories:
 - 1. Provide components as indicated or as required for a complete operating system.
 - 2. Rath 2100-VOIP2CS Basis of Design or approved substitution.
 - 3. Wiring: Provide manufacturer's recommended cables as indicated or as required for connections between system components, and in accordance with wiring methods indicated.
 - 4. Signage:
 - a. Call Station Instruction Signs: Raised character and Braille instructions complying with ADA Standards.
 - b. Product(s):
 - 1) Rath 7049SS Call Box Instruction Sign Basis of Design or approved substitution.
 - 2) Rath 7041E Photo Luminescent Sign Basis of Design or approved substitution.
 - 3) Rath 7087 Tactile Sign Basis of Design or approved substitution.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that characteristics of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Mounting Heights:
 - 1. Call Stations: Comply with applicable accessibility requirements.
 - 2. Control Stations: As indicated on drawings.
- D. Wiring Method:
 - 1. Provide Class A system wiring in accordance with NFPA 72 pathway performance requirements.
 - 2. Use listed plenum rated cables in spaces used for environmental air.
 - 3. Install wiring in conduit where required for rough-in, where required by authorities having jurisdiction, and where exposed to damage.
 - 4. Conduit: Comply with Section 26 05 33.13.
 - 5. Conceal all cables unless specifically indicated to be exposed.
 - 6. Route exposed cables parallel or perpendicular to building structural members and surfaces.
- E. Provide grounding and bonding in accordance with Section 26 05 26.
- F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- G. Identify system wiring and components in accordance with Section 26 05 53.
- H. Identify zones at control station(s) to indicate call station locations.
- I. Provide required instructional signage at each call station.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Test to verify wiring is free of shorts and grounds.
- C. Prepare and start system in accordance with manufacturer's instructions.
- D. Test system for proper operation.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

- A. Protect installed system components from subsequent construction operations.

END OF SECTION

This page intentionally left blank

**SECTION 28 00 00
SECURITY CONTROL SYSTEM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. The work described herein this section of the specifications governs all SCS sections of Division 28; excludes Fire Alarm Systems.

1.02 SYSTEM DESCRIPTION

- A. The work described herein and on the drawings consists of all labor, materials, equipment, and services necessary and required to provide, terminate and test a complete security control system (SCS). Any material not specifically mentioned in this specification or not shown on the drawings but required for proper performance and operation shall be provided.
- B. Provide an IP based SCS that fully integrates all Division 28 systems and other applicable divisions with the control system to ensure seamless integration and to allow for future expansion. This system shall allow any security function to be addressed by the control station in primary control of that particular area or by central control.
- C. The SCS is to include but not be limited to:
1. Programmable Logic Control System
 2. Control Stations
 3. CCTV System
 4. Door Control System
 5. Auxiliary Control Systems
 6. Miscellaneous Systems
 7. Security Management Server
- D. The electrical contractor shall provide and install all raceways, including standard back boxes, for all Division 28 systems. The Division 28 contractor shall coordinate all conduit requirements with the electrical contractor. The Division 28 contractor shall provide specialty back boxes to be installed by the electrical contractor. The Division 28 contractor shall provide and install all wiring and cabling required for a complete and fully functional system as intended by these specifications. All wiring and/or cabling shall be in conduit. The electrical contractor shall size and route raceways to accommodate the proper installation of the system cabling. In locations where raceway and/or conduit is not accessible after completion of the project, conduit shall be routed from device to device and shall be installed to provide access to junction and pull boxes. Different systems (i.e. locking and intercom) shall not share conduits. Contractor shall properly terminate each device according to the manufacturer's recommendations. Provide and install fire stopping where penetrations are made through rated walls and floors.
- E. In addition to the complete raceway system, the electrical contractor shall provide the following:
1. Emergency 120VAC power to all SCS equipment racks and cabinets.
 2. Emergency 120VAC power to all overhead and site vehicle barrier gates.
 3. Emergency 120VAC power to all control station locations.
 4. All wiring for branch circuits and switch legs for lighting and receptacle relay control panels.
 5. Terminate switch legs to all lighting and receptacle control relays.
- F. All SCS head end equipment shall all be housed in security equipment racks or cabinets (SER or SEC) specified herein this Division of the specifications.
- G. The Contractor shall provide and install all systems specified in Division 28 (including all equipment, wiring, etc.) in accordance with the Manufacturer's recommendations.
1. Installation of devices shall be in accordance with the Manufacturer's requirements as well as the requirements of the Contract Documents. Recommendations by the Manufacturer for the proper installation of the security control system and its equipment shall not preclude the requirement for the Contractor to comply with the requirements of the Contract Documents.

2. Terminations for each system shall be in accordance with the Manufacturer's recommendations, applicable requirements of the National Electric Code (NFPA 70), ADA, other applicable Codes and the Contract Documents.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with conditions in the Contract.
- B. Shop Drawings: Submit typical wiring diagram of each system, plan of building(s) and site showing pathways with cable noted, detailed drawings of each device location, and control room and equipment room/rack elevations. Shop drawings detailing the SCS are to include but not limited to the following:
 1. All drawings shall be drawn to scale that detail racks, enclosures, and/or field devices. All devices shall be shown.
 2. All SCS drawings generated for this project shall be created utilizing AutoCAD LT 2010 or greater file format. Drawings shall be submitted on a minimum of 21" x 15" ("C" size) sheets of paper.
 3. Drawings shall be provided for each field device detailing wiring and mounting instructions.
 4. Point-to-point wiring data shall be provided, utilizing a combination of AutoCAD generated drawings and security control point schedules. The schedules shall be created with Microsoft Excel and shall cross-reference AutoCAD drawings as required. Schedules shall detail all equipment being provided and controlled/monitored by the SCS. The schedules shall be organized according to different system functionality. Typical schedules shall include, but not be limited to, sections for cabling information, control locations, door hardware interface, intercom, paging, cameras, monitors, etc. The drawings and schedules shall indicate the wiring of components and all connections to be made. All schedules shall be included with the product data sheets in three ring binders.
 5. Drawings for the PLC configuration shall include model numbers of each component used.
 6. Provide all control station screen layouts. Layouts shall be created using the HMI software and shall not consist of line drawings created by CAD programs. The owner reserves the right at the time of the submittal review to request the division 28 contractor to make changes to the control station screen layouts based on the owner's policies and procedures, without incurring any additional cost to the owner.
 7. Drawings of equipment cabinet(s) or racks shall detail the arrangement of all components installed.
 8. Provide power distribution and power loading detail drawings.
 9. Provide wiring diagrams, detailing wiring for power, signal and control, differentiating clearly between manufacturers installed wiring and field installed wiring. Identify labeling scheme to be used for all cabling, headend termination equipment, and communication outlets.
 10. Submit a power system design spreadsheet of power loading for all DC power supply circuits and AC UPS circuits required by the SCS. The spreadsheet shall consist of each circuit, each device controlled by the SCS with each device's steady state and in-rush load, and a loading summary of all device types for each circuit.
- C. Product Data: Provide product data sheet(s) for type of product specified within division 28 of these specifications. Data sheets showing multiple products or models shall be clearly marked identifying the specific product or model being proposed. Provide original data sheets only. Fax copies are not acceptable. Product data sheets shall include the specification section that the product is located in at the top of each data sheet. Product data sheets shall be provided in three ring binders with tabs identifying each specification section.
- D. Submittals that do not include all items as listed above, and as required elsewhere in these specifications shall, at the discretion for the engineer, shall not be reviewed and shall be returned to the contractor for resubmittal.
- E. Provide three (3) sets in hardcover binders and one (1) electronic copy on DVD.

1.04 OPERATIONS AND MAINTENANCE MANUALS

- A. Provide maintenance data for materials and products, for inclusion in an Operating and Maintenance Manual. Provide complete manual material concurrently with the system submittal. Manuals shall include product data sheets for all equipment, operational description of all equipment software for each system using easy-to-understand terminology, programming/configuration instructions for all systems and all software programs, trouble shooting, repair, and preventative maintenance procedures. Manuals shall also include a complete list of PLC input and output points referencing the field device being controlled and/or monitored.
- B. Provide a list of spare parts that are being provided as a requirement of the Division 28 specifications. Provide direct telephone numbers for service (normal and emergency).

1.05 RECORD DOCUMENTS

- A. Within thirty (30) days of substantial completion, provide all information as required in sections 1.02 and 1.03. All information must be updated to reflect any and all changes made during the project. Clearly note all changes.
- B. Provide three (3) sets in hardcover binders and one (1) electronic copy on DVD.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Division/Section with minimum ten (10) years documented experience. The Manufacturer shall produce components for the PLC, locking, intercom, access control, HMI software and PLC Software. The manufacturer must advertise backwards compatibility to product line for minimum of ten (10) years. The locking control system components shall be UL 294 Listed.
- B. Contractor: Authorized distributor of specified manufacturer with minimum five (5) years documented experience.
- C. Contractor shall be properly licensed to install alarm systems in the state where project is located.

1.07 MAINTENANCE SERVICE AND WARRANTY

- A. Comply with all provisions of the Contract and of the Contract Documents.
- B. Provide a warranty for all material and labor provided as part of this division for one (1) year from Date of Substantial Completion.

PART 2 PRODUCTS**2.01 GENERAL**

- A. Uninterruptible Power Supply (UPS) System
 - 1. The Division 28 contractor shall provide a UPS system to provide backup power for the complete SCS. 120VAC power to locking devices shall be excluded from this requirement.
 - 2. The UPS system shall provide power to complete SCS for a period of ten (10) minutes in the event of a power failure.
 - 3. Provide the size and quantity of UPS units required to support the attached load with 25% headroom.
 - 4. Rack mount UPSs shall be provided to power all head end equipment. All rack mount UPSs shall be online (double conversion) type.
 - 5. All rack mount UPSs shall interface with the PLC System to provide annunciation of power failure and low battery alarms.
 - 6. Each rack mounted UPS shall be provided with an external bypass switch. The bypass switch shall match the power rating of the UPS.
 - 7. Local UPSs shall be provided at each control, enrollment and viewing station/console. These UPSs shall have a minimum rated capacity of 780W/1300VA.
 - 8. Approved manufacturers:
 - a. Liebert
 - b. APC
 - c. CyberPower

d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Security Equipment Racks

1. All SCS head end equipment, including power supplies, shall be mounted in 19" EIA racks. Racks shall be freestanding or wall mounted as shown on the contract drawings. If additional racks are required over the quantity shown on the contract drawings, the racks shall be provided as part of the bid.
2. Racks shall be ventilated and provided with fan units, as required, according to manufacturer's recommendations and actual heat loads of installed equipment.
3. Provide multi-outlet surge protection strips as required for installed equipment. All equipment shall plug into surge protection strips and not directly into UPSs or by pass switches.
4. The depth of each rack shall be sized to accommodate the equipment contained in the rack. Equipment racks that include video recording equipment or servers shall be sized at a minimum depth of 30".
5. Each freestanding rack shall include front and rear doors with locks provided and installed by the manufacturer. Each wall mount enclosed rack shall include a lockable front door. All locks shall be keyed alike.
6. All wall mounted racks shall be rated for the total load of the equipment to be installed plus 25%.
7. All wall mounted racks shall be hinged to allow the main body to swing out away from the wall to allow access to the back of the equipment installed in the rack. A lock shall be provided by the manufacturer on the hinge.
8. Provide cable management devices as required to neatly dress/organize cables in and out of rack.
9. Rack area to include two (2) 20 amp, 120 V duplex receptacles, each connected to separate 20 amp, 120V dedicated circuit. Mount in bottom area of rack.
10. No floor rack shall be mounted closer than 36" from any surface horizontal and vertical.
11. Approved Manufacturers:
 - a. Chatsworth Products
 - b. Middle Atlantic
 - c. Winsted.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Security Equipment Cabinets

1. All termination boards shall be mounted in NEMA Type 1 wall mount enclosures.
2. Provide cable management for routing all cabling.
3. Cabinets shall be sized per contract drawings and/or manufacturer's recommendation. If additional cabinets are required over the quantity shown on the contract drawings, the cabinets shall be provided as part of the bid.
4. Approved Manufacturers:
 - a. Hammond Manufacturing
 - b. Hoffman
 - c. Winsted.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Edge Network Switches

1. Switches shall be rack mountable.
2. Switches shall be 24 port and 48 port as applicable.
3. Switches shall support up to a 100 Mbps connection speed on all ports.
4. Switches shall support PoE on all ports.
5. Provide all required fiber transceivers to support the fiber connections as shown on the drawings. All fiber uplinks shall be 1 Gbps.
6. Basis of Design:
 - a. HP 2620 series or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

- E. Edge Network Switches
 1. Switches shall be rack mountable.
 2. Switches shall be 24 port and 48 port as applicable.
 3. Switches shall support up to a 1 Gbps connection speed on all ports.
 4. Switches shall support PoE on all ports.
 5. Provide all required fiber transceivers to support the fiber connections as shown on the drawings. All fiber uplinks shall be 1 Gbps.
 6. Basis of Design:
 - a. HP 2920 series or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Core Network Switch
 1. Switch shall be rack mountable.
 2. Switch shall be 24 port and 48 port as applicable.
 3. Switches shall support up to a 1 Gbps connection speed on all ports.
 4. Switch shall support PoE on all ports.
 5. Switch shall support Layer 3 routing.
 6. Switch shall support multicast routing.
 7. Provide all required fiber transceivers to support the fiber connections as shown on the drawings. All fiber uplinks shall be 1 Gbps.
 8. Basis of Design:
 - a. HP 3500yl series or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Category 6 Data Horizontal Cable
 1. UTP cable shall be extended between devices and their associated equipment rack. The cable shall consist of 4 pair 23 gauge, solid copper conductors, Certified to the Category 6 standards. Cables shall be terminated on 8-position modular jacks provided at each control, enrollment and viewing station/console. Cables shall be terminated using RJ-45 connectors at each field device (i.e. cameras).
 2. Cable Insulation and Jacket: Cable jacket shall comply with Article 800 NEC for the environment in which the cable will be installed.
 3. Horizontal Cables drops from the equipment racks to specified outlet locations and field devices are to be without splices.
 4. Approved Manufacturers:
 - a. Superior Essex
 - b. Berk-tek Lanmark
 - c. Commscope
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Category 6 Patch Panel
 1. Equipment racks shall be equipped with 19" rack mounted, 24 or 48 position 110 patch panels for termination of all copper horizontal cables.
 2. Patch panels shall be tested to meet the Category 6 standard for component and channel performance and shall be modular-to-110, wiring shall be T568B.
 3. Designation strips for each port shall be provided on the patch panel. All cables shall be terminated in numerical sequence and each position labeled as to outlet number and jack position as is noted for the outlets.
 4. Patch panels shall be provided in 24 or 48 port configurations as required for the termination of all system outlets and field devices.
 5. Category 6 rated patch cords shall be provided for connections to patch panels or SCS components. Patch cords shall be a component part of the CAT6 channel solution and have been tested as such.
 6. Approved Manufacturers:
 - a. Hubbell
 - b. Leviton

- c. Commscope
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Fiber Optic Cabling
 - 1. Multi-mode and/or single mode fiber optic cabling shall be provided between equipment rooms as designated on the contract drawings.
 - 2. Backbone/Riser Fiber Optic Cable shall:
 - a. Have fiber strand count as specified and as called for on the contract drawings.
 - b. Cable installed in plenum spaces/areas shall be plenum rated and marked OFNP (UL).
 - c. Cable used for multi-story building risers must be marked OFNR (UL) and meet UL 1666 flame test or be plenum cable as specified above.
 - d. Underground and exterior cables shall be rated for wet locations.
 - e. All fiber cables shall be tight buffered.
 - f. Multi-mode fiber optic cables shall be 50/125 OM2.
 - 3. Approved manufacturers:
 - a. Superior Essex
 - b. Hubbell
 - c. Berktek
 - d. Corning
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- J. Fiber Optic Termination
 - 1. Fiber optic cabling shall be terminated in rack mounted fiber distribution units (FDU) as described herein. FDUs shall be provided as required to terminate all fibers, complete with loaded SC Style adapter plates as required for terminations. All FDUs shall be provided with rack mounting hardware allowing the unit to be placed in a standard EIA 19" rack. Provide blank adapter in all unused openings in the FDU. All panels shall include strain relief points where fiber optic cable strength members shall be securely attached.
 - 2. All terminations shall be accomplished using fusion splicing. Mechanical terminations are not acceptable.
 - 3. Provide fiber optic patch cables as required to make all connections for the SCS.
 - 4. Approved Manufacturers
 - a. Hubbell
 - b. Leviton
 - c. Approved equal
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- K. Surge Suppression
 - 1. The contractor shall have equipment installed on the AC voltage supply and other lines taking care to arrest damaging electrical transient and spikes which can cause damage to the components of all systems.
 - 2. All surge protection devices shall have the lowest surge voltage rating per U.L. 1449 that is consistent with the line levels.
 - 3. All exterior devices not mounted directly to a building or below the roof line of a building shall have surge protection installed to protect the connected head end equipment.
 - 4. 120VAC surge protection shall be installed on all circuits feeding security devices.
 - 5. Surge protection devices shall be installed in the cabinet or rack where the protected field device is terminated.
 - 6. Approved surge protection manufacturers:
 - a. Transtector
 - b. CyberPower
 - c. Phoenix Contact
 - d. Leviton
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- L. Spare Parts

1. Provide the following spare parts for all Division 28 specification sections:
 - a. One (1) PLC
 - b. One (1) Data Module
 - c. Two (2) Discrete I/O Module
 - d. One (1) Logic Power Supply
 - e. One (1) 24VDC Power Supply (if used)
 - f. Ten (10) Relays of Each Type
 - g. One (1) Digital Intercom Amplifier
 - h. Two (2) Remote Intercom Stations
 - i. Two (2) Page Speakers of Each Type
 - j. Two (2) Cameras of Each Type
 - k. One (1) Control Station Computer. Computer shall have a fully licensed copy of the HMI and PLC software and all databases.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is a factory trained service representative to perform the work in this division. All installers must be BICSI certified.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electric Code."
- C. EIA Compliance: Comply with the Electronics Industries Association standards.
- D. Compliance with Local Requirements: Comply with the applicable building code, state and local ordinances, and regulations and the requirements of the authority having jurisdiction.
- E. NFPA Compliance: Provide systems conforming to the requirements of the NFPA 101, "Life Safety."
- F. BICSI Compliance: All submittal drawings must be reviewed and stamped by a BICSI RCDD who is fully employed by the integrator.
- G. UL Listing and Labeling: Provide components specified in this Section that are listed and labeled by UL.

3.02 EXAMINATION

- A. Examine conditions prior to installing SCS components.
- B. Do not proceed until unsatisfactory conditions have been corrected.
- C. Verify that surfaces and areas are ready to receive work.
- D. Verify field measurements as instructed by manufacturer.
- E. Verify that required utilities are available, in proper location, and ready for use.

3.03 INSTALLATION

- A. Weatherproofing: Provide NEMA 4X rated enclosures for electronics which are to be mounted outdoors or exposed to weather.
- B. Repairs: Wherever walls, ceilings, floors or other building finishes are cut for installation, repair, restore, and refinish to original appearance.
- C. All system cables and power wiring shall be kept physically isolated from each other at all points. Lace and form wires from components to terminals and fasten securely.
- D. Wires and cables in equipment cabinets and service cabinets shall terminate on terminal strips or on connectors provided with equipment.
- E. Install system equipment panels in locations shown; arrange to provide adequate ventilation and access.
- F. Install the SCS in accordance with all applicable sections of the NEC and BICSI standards.
- G. All exposed wiring inside and outside the control console, cabinets, boxes and similar enclosures, shall be dressed down neatly and secured with wiring cleats or wire ties.

- H. Provide and install a complete grounding system as required to comply with all sections of these specifications and applicable codes.

3.04 INITIAL PROGRAMMING AND CONFIGURATION

- A. Contractor shall provide initial programming and configuration of the security management system. Programming shall include defining hardware, doors, monitor points, clearance codes, time codes, door groups, alarm groups, operating sequences, camera call-ups, and the like. Input of all program data shall be by the contractor. Contractor shall consult with Security Consultant and Owner to determine operating parameters at the time of submittal review.
- B. Contractor shall develop and input system graphics, such as maps and standby screens. Owner shall provide floor plan drawings as the basis for the creation of maps. Development of maps shall include the creation of icons for all doors, monitor points, and tamper circuits. Owner shall provide floor plan drawings in the form of Autocad .DWG or .DXF files, as the basis for the creation maps.
- C. The owner, with the cooperation and assistance of Contractor, will enroll the template of each authorized system user.

3.05 FACTORY TESTING

- A. The SCS, excluding field devices, shall be assembled complete and 100% tested in the Division 28 contractor's facility prior to shipment of the head-end equipment to site. All software for all systems shall be programmed and tested.

3.06 COMMISSIONING

- A. Place entire system into full and proper operation as designed and specified.
- B. Verify that all hardware components are properly installed, connected, communicating, and operating correctly.
- C. Verify that all system software is installed, configured, and complies with specified functional requirements.
- D. Perform final acceptance testing in the presence of OWNER'S representative, executing a point by point inspection against a documented test plan that demonstrates compliance with system requirements as designed and specified.
- E. Conduct final acceptance tests in presence of OWNER'S representative, verifying each device point and sequence is operating correctly and properly reporting back to control panel and control center.
- F. The system shall not be considered accepted until all acceptance test items have been successfully checked-off.

3.07 ADJUSTING, CLEANING, AND PROTECTION

- A. At final completion all hardware shall be left clean and free from disfigurement. The contractor shall make a final adjustment to all Division 28 devices, in strict compliance with manufacturer's instructions. Where hardware is found defective, repair or replace or otherwise correct as directed.
- B. Prior to final acceptance, clean system components and protect from damage and deterioration.
- C. The Contractor is responsible for the proper protection of all items of hardware, as it is stored on site in a covered and dry place, and is installed during construction.

3.08 TRAINING

- A. Train Owner's personnel in the procedures involved in the operating, maintaining and administration of the system. Provide sixteen (16) hours training during normal business hours. Training shall include two (2) sessions at eight (8) hours each classroom instruction for the people selected by the owner.
- B. Schedule training with the owner through the architect, with at least seven (7) days advance notice.
- C. Provide a system specific DVD training video to the owner. The DVD training video shall contain training modules for each specific portion of the system. Each training module shall cover all system operation, maintenance and administration of the SCS. Provide a copy of the DVD training video to the owner upon substantial completion.

- D. The owner will designate personnel to be trained.
- E. Training shall be oriented to the specific system being installed under this contract as designed and specified.
- F. Training sessions are to be held at Owner's facility and are to be scheduled at the convenience of owner. Contractor shall provide written training outline and agenda for each training session prior to scheduling.
- G. Contractor shall provide ten (10) copies of written training materials.

3.09 MAINTENANCE AND SERVICE

- A. The contractor shall use technicians that are trained by the manufacturers of the SCS components.
- B. During the warranty period, all service (including equipment, labor, travel, expenses, etc.) is to be provided during normal working hours at no cost to the Owner. On-site service must also be made available at times other than normal working hours to the owner and shall be charged by the contractor's service representatives at current rates of labor and travel. The contractor shall provide the owner with a manned, 24-hour phone number for service. The contractor shall provide an on-site response time of one (1) business day for system critical items during regular business hours. "Critical" items are items that cause multiple devices to not function properly (i.e. power supplies, PLCs, control stations, etc.).
- C. The guarantee shall exclude acts of God, vandalism, physical abuse, power events or operator misuse. The contractor shall not be required to provide or diagnose problems associated with door position switch or lock problems without additional reimbursement. The contractor shall not be responsible for any existing field devices/equipment that is not functional for whatever reason.

END OF SECTION

This page intentionally left blank

SECTION 28 00 10
PROGRAMMABLE LOGIC CONTROL SYSTEM**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements and operational characteristics for the Programmable Logic Control (PLC) System.

1.02 SYSTEM DESCRIPTION

- A. The PLC System provides the logic control for the SCS. Unless noted otherwise, all user-initiated interfaces to the PLC system is performed through the control stations (reference section 280020).
- B. The PLC System CPU program(s) shall execute all system commands and operations. The control station(s) are for operator interface only. All control functions are to be executed by the PLC CPU program(s).
- C. The SCS network shall be a distributed, fault-tolerant network. PLC CPU or communication failures shall not affect other PLC's or control station(s) on the network.

1.03 SYSTEM REQUIREMENTS

- A. Provide a complete and fully functional Ethernet based PLC System using materials and equipment of types, sizes, and rating, as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- B. All components of the PLC System shall be regularly sold to the corrections market. The PLC manufacturer must advertise its policies on backwards compatibility. The PLC manufacturer must guarantee the availability of spare parts for the life of the facility.
- C. A licensed copy of the PLC programming software shall be provided on each control station computer. Unlocked copies of all jobs specific files shall be provided to the owner as part of the as-built package.
- D. The PLC manufacturer will provide unlimited free training for owner representatives at the manufacture's facilities. The manufacturer shall not be responsible for travel expenses.
- E. Modular components of the system shall be UL 294 listed or recognized.

PART 2 PRODUCTS**2.01 EQUIPMENT AND MATERIALS**

- A. PLC Central Processing Unit
 - 1. The central processing unit (CPU) shall be microprocessor based and shall provide the logic control functions and data transfer based upon the program stored in memory and the status of the inputs and outputs. The controller must be able to support up to 4,096 input and outputs.
 - 2. All PLC communications shall be done over a single Ethernet port.
 - 3. The PLC Network shall follow the network guidelines previously set forth in these specifications.
 - 4. The minimum standard control functions of the CPU shall include:
 - a. Higher Language Programming (spread sheet type format).
 - b. Latching relays
 - c. Timer clock pluses (.02s, 1s, 0.2s, 1s, & 1m) and timers (.01 & 0.1 sec. Increments).
 - d. Counters (up/down)
 - e. Data comparison (=, <,>), data range comparison, and data table comparison.
 - f. One-shot output and input controls.
 - g. Master control relays (interlocks)
 - h. I/O Refresh on command, immediate I/O inputs, and scheduled interrupt on command.
 - i. On-line program edit capabilities.

5. The following minimum modes of operation of the CPU must be selectable using programming software commands:
 - a. PROGRAM – Processor is not scanning program in memory and all outputs are held OFF.
 - b. MONITOR – Processor is executing program and changes in user memory and data memory are allowed
 - c. RUN – Processor is executing program in memory and outputs are controlled by the program. No editing of program or data registers is allowed.
 6. The above settings shall require using programming software loaded on a computer to change the operating mode of the CPU.
 7. The processor shall incorporate extensive self-diagnostic features, which will not halt the processor. In addition, separate visual indicators will annunciate at the following conditions:
 - a. POWER – Logic power is applied to the CPU and I/O rack from the power supply.
 - b. RUN – Processor is executing the program in memory and outputs are being controlled according to the program.
 - c. NETWORK ACTIVITY – Indicating the CPU communication with the network.
 - d. NETWORK LINK – Indicating the CPU is connected to a network.
 8. In addition to visual self-diagnostic indicators (LEDs) the processor shall have a specifically designated block of at least 100 words and bits. These shall provide more detailed system status and fault diagnostic information accessible by programming equipment or intelligent peripherals.
 9. The processor must contain an error log area. This area must be able to log what error occurred and when the error happened, giving exact time and date. This area must be able to store a minimum of 1,000 records.
 10. The PLC shall support a web browser interface for configuration and diagnostics.
 11. The PLC shall be UL294 listed.
 12. Basis of Design:
 - a. MTI 91795 Embedded Controller or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Data Module
1. The module shall support 8 independent data channels. Each channel must support up to 64 inputs and outputs.
 2. All communications between the PLC and data module shall be Ethernet based.
 3. Each data module shall distribute all power to the local discrete I/O modules and termination boards.
 4. Data Modules shall be powered by a 12V DC power supply and shall be capable of supplying up to 12 watts of power to each data channel.
 5. The data module shall be UL294 listed.
 6. Basis of Design:
 - a. MTI 91620 Data Module or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Discrete I/O Module
1. Each discrete I/O module shall be a self-contained unit housed within an enclosure so that no part of its circuit board is exposed to contact by handling.
 2. Discrete I/O modules shall be UL listed.
 3. It shall be possible to replace any I/O module without removing or disturbing user field wiring.
 4. All I/O modules units shall be solid state in nature. The output units shall be transistor types for long life and high DC reliability.
 5. I/O modules should control 16 outputs and monitor 16 inputs.
 6. The I/O modules shall communicate with the Data Module
 7. I/O updates shall take no longer than 50 milliseconds.
 8. The discrete I/O module shall be UL294 listed.
 9. Basis of Design:
 - a. MTI: 81650 Decoder or approved substitution.

- b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Electric Lock Termination Board
 - 1. Provide an electric lock termination board between the PLC and electric locks, door position indicators, door operators and door control components.
 - 2. If the door hardware allows, the system shall monitor the status of the door position and lock position switches. The door position and lock position switches shall be terminated in series at the door and shall be monitored by a single input to the PLC.
 - 3. Each locking termination board shall provide terminations for 16 doors and shall have the following features:
 - a. Normally open, normally closed, fused line, and common connections per address for door control
 - b. Door status input per address
 - c. Input supervision
 - d. Socket relay connectors
 - e. Individually fused door lock circuits
 - f. Capability of providing isolated line voltages to the first and last eight addresses
 - g. Pluggable, screw type connectors for field device terminations
 - 4. Provide low voltage power supplies as needed at each termination board to provide power to locking devices. 120VAC shall be provided by the electrical contractor at each termination board as needed for locking devices. Roll-up door or gate operators shall have a dedicated power circuit provided by the electrical contractor. Special low voltage power supplies required to be installed in close proximity to REX locking devices shall be provided and installed by others.
 - 5. The lock termination board shall be UL294 Listed.
 - 6. Basis of Design:
 - a. MTI #81623 or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Relays
 - 1. All locks shall be controlled using mechanical relays. The relays shall plug into the locking termination board. Each relay shall have a normally open and closed output rated at a minimum of eight amps.
 - 2. Basis of Design:
 - a. Omron G2R-1 Series or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Input Termination Board
 - 1. Provide an input termination board between the PLC and all dry contact input devices.
 - 2. Each input termination board shall provide terminations for 16 inputs and shall have the following features:
 - a. Input supervision
 - b. Pluggable, screw type connectors for field device terminations
 - 3. The input termination board shall be UL294 Listed.
 - 4. Basis of Design:
 - a. MTI #81222 or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- G. PLC Programming Software
 - 1. The PLC programming should be done in high level language (such as a spreadsheet format). Ladder logic programming is acceptable, but the PLC supplier shall provide unlimited technical support at no charge to the end user.
 - 2. It shall be possible to program and monitor any PLC from a single host computer via the LAN.
 - 3. Programming software must be compatible with all current Microsoft operating systems.
 - 4. It shall be possible to delete part of the program without affecting the remainder of the program.

5. It shall be possible to force any input, output, or internal bit ON or OFF using the programming software.
 6. The programming software shall protect access to the schedules using passwords.
 7. Basis of Design:
 - a. MTI PLC Software or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Logic Power Supplies
1. Logic Power Supplies feed power to the PLC, Data Modules, Intercom Amplifiers, and Discrete I/O Modules.
 2. Power supplies should be sized per manufacturer's recommendation.
 3. Power supplies for the Data Modules and Discrete I/O Modules shall be din rail mountable.
 4. Power supplies should accept an input voltage range of 90-264VAC.
 5. Basis of Design:
 - a. Lambda DSP Series or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 GENERAL

- A. All work required herein shall comply with section 28 00 00 Security Control System.

END OF SECTION

**SECTION 28 00 20
CONTROL STATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements and operational characteristics for the control stations (CS) comprised of the following equipment that shall be 100% integrated with the SCS:
 - 1. Computers and Monitors.
 - 2. HMI Software.
 - 3. Design Software.

1.02 SYSTEM DESCRIPTION

- A. The CS shall operate as a graphical interface between the correction officer and the electronic security monitoring and control equipment. The CS shall display the status of monitored points and shall control output points.
- B. A network connection shall exist between all CSs and the Programmable Logic Controllers (PLC). The CS shall not directly control the security devices. The security devices shall be controlled by the PLC using interposing relays as described elsewhere in this specification.
- C. The SCS shall allow for all CSs to operate together as a seamless, integrated system.

1.03 SOFTWARE REQUIREMENTS

- A. The CS shall have the following software requirements to allow for seamless control and maximum flexibility:
 - 1. Control Icons
 - a. Central Control shall have the ability to view and control all screens of the facility with status of all devices regardless of which CS has primary control of those devices.
 - b. Local CSs shall display icons of doors, intercoms, cameras, etc., which are under its' primary control. Local CSs shall have the ability to be assigned to different 'task groups' to allow for maximum operational flexibility.
 - 2. Takeover
 - a. The Central Control CS(s) shall have the ability to takeover or disable any combination of local CSs.
 - b. Upon takeover from Central, the intercom queues from the disabled stations will rollover to the Central Control CS(s).
 - 3. Touchscreen Login Validation
 - a. Each CS shall require Login Validation from the Security Management Server (SMS) via a PIN code. On the Login Screen, the CS shall display a keypad for the operator to enter a PIN code.
 - b. As an option, the CS shall require Login Validation from the SMS via a local proximity card reader or a USB fingerprint reader connected to the CS.
 - c. Login Validation shall be integrated with the SMS's database to allow tracking of the operator's name for all functions at each CS until it is logged off.
 - d. If the CS cannot communicate with the SMS, then the CS shall authenticate users against a local cache of credentials generated from the previously successful authentication attempts.
 - e. An operator remains the current operator until logged out or until the CS is taken over or disabled.
 - 4. Event Logging
 - a. All actions taken by the CS operator shall be logged to the SMS.
 - 5. Graphic display call-up time of 500 milliseconds maximum for all graphics.
 - 6. Variable update time of 500 milliseconds for variables from multiple PLC's.

1.04 SYSTEM OPERATION

- A. Unlock Function – Swing:

1. Pressing the door icon will apply power to the lock and activate the unlock cycle.
 2. The icon will illuminate steady red when the door is open or unlocked. The icon will be black when the door is closed and locked.
 3. Two or more doors may be in an interlock group. When any door in an interlock group is open or unlocked, the remaining doors in that group cannot be opened without using interlock override. (See: "Interlock Operation")
- B. Open/Stop/Close Operation
1. Pressing the open icon will cause the door/gate to begin opening. The door/gate will continue opening until fully open or until the stop or close icon is pressed.
 2. While in motion, pressing the stop icon will cause the door/gate to stop.
 3. Pressing the close icon will cause the door/gate to begin closing. The gate will continue closing until fully closed or until the stop or open icon is pressed.
 4. The icons will illuminate steady red when the door/gate is open or unlocked. The icons will be black when the gate is closed and locked.
- C. Monitored Door Operation:
1. The icon will illuminate steady red when the door is open or unlocked. The icons will illuminate steady green when the door is closed and locked.
- D. Intercom Operation:
1. When a call button on a remote intercom station is pressed, the icon will flash green and an audible intercom tone will sound.
 2. Pressing the intercom icon will cause the flashing green icon to illuminate steady green, silence the audible tone and connect the remote intercom station speaker to the CS's intercom amplifier.
 3. While connected, sound in the area of the remote intercom station will be transmitted to the CS.
 4. The CS operator can talk to the selected intercom station by pressing and holding the Push to Talk (PTT) icon on the CS. When the PTT icon is released, sound from the intercom station shall again be transmitted to the CS.
 5. Pressing the intercom icon again will disconnect the remote speaker from the CS's intercom amplifier and turn the icon back to gray.
 6. The CS operator may connect the remote intercom station to the CS's intercom amplifier as in item 2 without the remote call button being pressed as in item 1.
 7. Intercoms can also be answered / reset by using the intercom icons.
 - a. When a remote intercom station is pressed, the intercom call will be listed in the intercom queue. The queue shall show the intercom station call-ins in the order received.
 - b. Pressing the Select (SEL) icon will connect the intercom station at the top of the queue and change the screen to display the selected intercom station.
 - c. The intercom-reset icon will disconnect any currently connected intercom station.
 - d. If the control system has CCTV system integration included, the camera associated with a selected intercom station shall be pulled up on the spot monitor when an intercom station is selected.
- E. Duress Operation:
1. Pressing a duress button anywhere in the facility will generate a "duress alarm" condition.
 2. The associated duress alarm icon will flash, an alarm description will be displayed in the alarm status bar, an audible duress alarm will sound, and the "go to alarm" icon will flash red.
 3. Pressing the flashing "go to alarm" icon will change the screen to display the active alarm.
 4. Pressing the flashing duress alarm icon and then pressing the acknowledgement button will silence the audible tone and turn the duress alarm icon to a steady red.
 5. After the alarm condition has been cleared (the duress button has been reset), pressing the duress alarm icon and then selecting the reset button will reset the alarm and the duress alarm icon will disappear.
- F. Emergency Release Operation:

1. Pressing the emergency release icon will activate a red pop up window displaying the text "EMERGENCY RELEASE – ARE YOU SURE? YES or NO".
 2. Pressing the YES button will activate the emergency release function. The emergency release icon will flash red, and all associated doors will open and REMAIN open.
 3. Pressing the NO button will close the pop-up window and cancel the action.
- G. Group Release Operation:
1. Pressing the group icon will open all of the doors in that group. Individual doors may be removed from group release by touching the 'Protect/Isolate' icon and then touching the desired door. When a door has been isolated from the group mode, the door icon will become shaded grey and that action will be recorded to the Alarm/Event logging. To remove a door from the protect/isolate mode, touch the 'Protect' icon and then the door icon. The grey shading on the icon will disappear and that action will be logged to the activity report screen.
- H. Camera Operation:
1. Pressing a camera icon will display the associated camera on the spot monitor, and the icon will illuminate green.
 2. Pressing the camera icon a second time will turn the associated camera icon to gray.
- I. Interlock Operation:
1. If any door in an interlock group is open or unlocked, the other doors in that group will have a yellow border around their icons.
 2. To open more than one door in an interlock group, press the interlock override icon and the next door in the interlock group you wish to open. This action will be displayed in the activity/event screen and logged.
 3. The interlock function remains active for a period of time adjustable from 0-30 seconds.
- J. CS Disable Operation:
1. To disable a CS, press the CS disable icon. All functions of the selected CS will be disabled immediately and will be transferred to Central Control.
 2. The CS disable icon will be shown with an "X" over it.
 3. To enable the control panel, press the CS disable icon. All functions of the selected CS will be enabled and will be transferred back to the selected CS.
 4. The enabled CS operator will have to log in to the control software to fully restore control.
 5. The CS disable icon will be shown without the "X" over it.
 6. The Central Control CS(s) shall have the ability to disable and enable any remote CS.
- K. Page Operation
1. The CS operator shall have the ability to address individual paging zones or all page zones at once using an "All Call".
 2. To address individual page zones, the CS operator shall first select the page zone by direct selecting the desired page icon or dialing the page zone up in the intercom keypad. (see "Intercom Operation")
 3. When a page zone is selected, the corresponding page icon will illuminate green.
 4. While a page zone is selected, sound shall be transmitted from the CS to the corresponding paging speakers.
 5. Once a page is complete, the CS operator shall end the page by direct selecting the page icon or by pressing the Reset button on the keypad.
 6. The page icon shall be gray when the corresponding page zone is not selected.
 7. The CS software shall support a facility wide all-call. To perform an all-call, the CS operator shall dial "AC1" into the intercom keypad on the CS and press the Select button. All paging zones shall be selected and sound shall be transmitted from the CS to all page zones.
 8. The all-call shall be reset by pressing the Reset button on the intercom keypad.
- L. Site Screen Operation
1. The CS shall have a separate screen which shows a site plan. The site plan shall show a graphical rendition of all areas of the facility under the CS's control.

2. Pressing an outlined area for a particular section of the facility shall cause the CS to go directly to the screen that controls the touched area.
 3. As an option, the site plan shall be located on each screen. If this option is used, the site plan shall be sized to prevent obstruction of the floor plan on each screen. The area on the site plan that represents the current screen shall be highlighted in white so that the operator knows exactly what screen is active in relation to the other parts of the facility.
- M. Power Supply Alarm Operation
1. When the loss of main AC power is detected and the control system reverts to UPS or emergency power, the power supply alarm icon shall flash red and an alarm shall sound. The power supply alarm shall remain in alarm mode until main AC power has been restored.
 2. The alarm shall be silenced and the power supply alarm icon shall be solid red when the Alarm Silence button is pressed.
 3. Once main AC power has been restored, the power supply alarm shall automatically clear if the alarm has not been silenced. If the power supply alarm is silenced and main AC power has been restored, the alarm shall clear when the Alarm Reset button is pressed.
- N. Ground Fault Operation
1. When a ground fault is detected, the ground fault icon shall be solid red. The ground fault icon shall remain solid red until the ground fault has been cleared from the system.
- O. Fire Alarm Operation
1. The CS provides secondary annunciation of fire alarms.
 2. Once a fire alarm has been detected, the corresponding fire alarm icon shall flash red and an alarm shall sound. The fire alarm shall remain in alarm mode until the fire alarm has been reset at the fire alarm panel.
 3. The alarm shall be silenced and the fire alarm icon shall be solid red when the Alarm Silence button is pressed.
 4. Once the fire alarm has been reset, the fire alarm shall be cleared by first pressing the Alarm Silence button and then the Alarm Reset button. If the fire alarm was silenced prior to the fire alarm being reset at the fire alarm panel, the alarm shall clear when the Alarm Reset button is pressed.
- P. Alarm Silence Operation
1. Pressing the Alarm Silence icon shall silence the audible enunciators used to indicate alarms.
- Q. Alarm Reset Operation
1. Pressing the Alarm Reset icon shall reset an alarm as long as the cause of the alarm has been addressed.
- R. Right Click Menu Options
1. The following software functions shall be selectable from a menu when an operator is logged in with administrative privileges.
 - a. Prop Alarm
 - 1) If the Prop option is selected for a door and the door is propped or held open longer than the assigned time, an alarm will sound at the CS, notifying the operator of an unsecured condition. An operator must have administrator rights to set a Prop alarm.
 - b. Breach Alarm
 - 1) If the Breach option is selected for a door and the door is opened by any means other than from the CS, a breach alarm will sound at the CS, to notify the operator of that condition. An operator must have administrator rights to set a Breach alarm.
 - c. Hold Open
 - 1) If the Hold Open option is selected for a door, the door lock for the selected door shall be held in until the Hold Open option is turned off for that door.
 - d. Protect
 - 1) If the Protect option is selected for a door, the door shall not open by any other means than by the operator directly selecting the door. If the Protect option is selected for an intercom, the intercom icon shall flash but not sound when the call-in

button is pressed at the remote intercom station. Icons that are 'Protected' shall be shaded gray on the CS.

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Control Station Computer:

1. The computer shall have the following minimum requirements:
 - a. Intel Core i7-6700, 3.4GHz, 8MB Cache, 4 Cores
 - b. Windows 7 Professional 64 bit
 - c. 8GB, DDR4, 2133 MHz
 - d. 128GB Solid State Drive (SSD)
 - e. 2GB Dedicated RAM, Dual Outputs
 - f. Gigabit Ethernet Adapter
 - g. Wireless
2. Computer shall be powered via a local UPS.
3. Manufacturers:
 - a. HP.
 - b. Dell.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Touch Screen Monitor:

1. 22" (diagonal)
2. LED
3. 1920 x 1080
4. 16.7 million
5. 250 nits
6. 5 msec (typical)
7. 170 degrees
8. 160 degrees
9. 1000:1
10. DVI and VGA Connector
11. 3.5mm TRS Jack
12. Two 2W Internal
13. USB
14. 29W (typical)
15. 0C to 40C
16. Basis of Design:
 - a. ELO Touch Systems 2201L or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

C. CS HMI Software

1. The software shall consist of a human machine interface (HMI) system with support for supervisory and process control, real-time data acquisition, alarm and event management, historical data collection, report generation, local or remote telemetry communications to PLC's, and internet/intranet access. The software shall be easy-to-use, with an object-oriented graphics development environment and have an open architecture, which utilizes the latest in Microsoft client/server networking technology.
2. Runtime User Interface Software Requirements:
 - a. The software shall be licensed to support any of the hardware levels of user interface (i.e. server, PC, tablet) running the latest Microsoft Windows operating system.
3. Runtime Security:
 - a. The runtime software shall include a security system under Windows security to enable various operator tasks based on the user level and password. Access to all displays and to all command functions shall be based on the operator's security level to protect against

- unauthorized use. After initial creation, only an assigned user with proper authorization or the system administrator shall modify the password.
- b. The security system shall be capable of disabling access to all Microsoft Windows controls (file menu, close, minimize, etc.) and keyboard commands (Ctrl-ESC, Alt-Tab, and Ctrl-Alt-Del).
4. Logging Operator Actions:
 - a. All operator actions shall be logged to an event logger. The event logger shall keep track of each new operator log-on, log-off or device control.
 - b. Each event log shall record the date, time, operator logged in and the type of action taken.
 5. Alarm Management Functions:
 - a. Alarms shall be detected and reported by an Alarm Manager Service. The Alarm Manager Service shall support no less than forty (40) simultaneous alarm client displays.
 - b. It shall be possible for the operator to filter the alarm display based on priority level, groups or process area. In distributed network systems, alarms shall be viewed and acknowledged from any workstation and the information shall be distributed to all clients. The name of the operator and the node acknowledging the alarm shall be capable of being displayed in the Alarm Summary.
 - c. The alarm display shall support up to eight different combinations of colors based on the priority of the alarm and whether it is acknowledged or unacknowledged.
 - d. The system shall provide a method of notifying the user when a new alarm has occurred.
 - e. The operator shall be able to select and acknowledge alarms individually, by group or area. The operator shall also be able to acknowledge only those alarms visible in the display, only those selected, only the most recent alarm or all alarms in the system. The alarm display shall allow alarms to be selected by clicking on them with the mouse at runtime.
 - f. The operator shall be able to select an alarm from the alarm summary display and the system shall switch to the corresponding screen as to the particular section of the control system where the alarm originated.
 - g. It shall be possible to inform the operator of an alarm condition via an audible tone, a pop-up display, or any combination of animation types on the screen.
 - h. Alarms shall be logged to the SMS.
 - i. Alarms may be printed to a locally connected or network printer from the SMS.
 6. Basis of Design:
 - a. MTI ProVision.
 - b. Wonderware.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- D. CS Development Software
1. Each CS shall have a full version of the CS database development software.
 2. The CS database shall be developed using a standard Windows based software package and is 100% compatible with the specified PLC programming software.
 3. The software manufacturer shall provide a regular schedule for training classes to be held at the manufacturer's factory.
 4. The software manufacturer shall provide free phone technical support for the life of the software.
 5. Basis of Design:
 - a. MTI ProDesign or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 GENERAL

- A. All work required herein shall comply with section 280000 Security Control System.

END OF SECTION

**SECTION 28 20 00
IP VIDEO MANAGEMENT SYSTEM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Provide an IP Video Management System (VMS) which is fully integrated with the Security Control System.
- B. The VMS system shall allow any remote camera to be viewed by monitors located in control rooms and controlled by the control station in primary control of that particular area, and by the control station(s) in Central/Main Control.
- C. Provide all labor, equipment, materials, and supervision to install, program, calibrate, adjust, document, and test the total system as required herein and on the drawings.

1.02 SYSTEM DESCRIPTION

- A. The IP VMS shall be an IP network-based, fully distributed digital video system. The security video system will utilize local area networks (LAN) as a transmission medium for video, configuration, as well as storage of all data.
- B. The VMS shall provide full video control at any point within the network from a workstation. The security video system shall provide unlimited expansion capability for the addition or modification of video inputs.
- C. The VMS shall support recording of MJPEG, MPEG-4 and H.264 IP video streams.
- D. The VMS shall support video cameras with a resolution of up to 28 Megapixel.
- E. The VMS shall support ONVIF S and G profiles.
- F. The IP VMS shall permit normal and event monitoring of all secured areas on digital monitors as shown on the drawings or as described in these specifications. Video monitoring stations and consoles shall be installed as shown on the drawings and described in these specifications. In all cases, the method of communication from remote locations within the network to the central components shall be transparent to the user.
- G. The Contractor shall furnish and install all security video cameras, mounts, housings, power supply systems, UTP cable, network cables, connectors, equipment racks, monitors and consoles, network switches, work stations, storage management servers, encoders, decoders, and all other hardware and software to provide a fully operational system.
- H. All cameras shall be recorded at each camera's maximum resolution and frame rate. The system shall have enough storage to store the recorded video for thirty (30) days. Cameras shall be recorded continuously or on motion per the camera schedule. An activity level of 50% shall be assumed for all cameras recording on motion.
- I. Storage Management Servers (SMSs) shall be configured using fault-tolerant RAID-6 drive arrays. SMSs shall be sized as specified herein and in the quantities as required to meet the storage requirements.
- J. The IP VMS shall incorporate a fault tolerant architecture and shall include redundancy in critical areas of concern. All servers shall include redundant power supplies. Redundant servers shall be provided for the Core Media Gateway and Accessory Servers. One (1) redundant Storage Management Server shall be provided to serve as a hot standby for active servers.
- K. Review capabilities for the digitally recorded video via the secure network specified without interruption to recording capabilities.
- L. The IP VMS shall be able to handle future expansion of an unlimited total capacity from what is shown in the drawings, including but not limited to cameras, monitors, alarm circuits and relay closures.
- M. The IP VMS network shall be arranged so each area will operate independently and shall communicate via a 1000baseT (Giga-bit) network at a minimum. The system shall utilize virtual

matrix switcher capabilities through the use of a Media Gateway. The Media Gateway shall provide a user interface and database management of the IP video management system.

- N. Viewing stations shall be provided as shown on the drawings. In addition to the viewing stations, the integrator shall provide ten (10) licenses for the client viewing software to be loaded by others on Owner provided computers. The software shall provide the functionality as specified for the client workstation.
- O. The intent of this specification is to provide to the owner an IP VMS supplied by the Contractor and shall be a complete and operational system per the performance requirements and objectives of these specifications. Contractor shall be responsible for the coordination of related work with other trades affecting his work or the work of others.
- P. The IP VMS shall be provided with all required software and maintenance licenses. There shall be no recurring licensing or support fees for any software or component provided as part of the system for a period of five (5) years from the date of substantial completion. The integrator shall be responsible for all additional fees charged by the VMS manufacturer during the five (5) year period.
- Q. All components of the system, including software, shall be the product of one manufacturer and shall have a single point of contact for the support of all components. The Owner shall be provided with the availability of a toll-free (U.S. and Canada), 24-hour technical assistance program (TAP) from the manufacturer. The TAP program shall allow for immediate technical assistance for either the dealer/installer or the end user at no charge for as long as the product is installed.

1.03 SYSTEM FEATURES AND SOFTWARE REQUIREMENTS

- A. The IP VMS shall have the following system software requirements to allow for seamless control and future flexibility.
- B. Complete integration of video system with the PLC control system.
- C. All control stations shall have the ability to call up any camera to their associated spot monitor.
- D. The video system shall be programmed so that a description is associated with every camera. Contractor shall coordinate with owner.
- E. The video system shall provide for call-up of camera signals to assigned monitor locations based on pre-programmed responses to operator input utilizing the touch screen control stations.
- F. The video system shall be configured for automatic camera call-up for:
 - 1. Connected intercom calls.
 - 2. Duress Alarms (if applicable)
 - 3. Perimeter Detection Alarms (if applicable)

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. The basis for the specification is Pelco. Products manufactured by companies other than those expressly approved shall not be acceptable.

2.02 CORE AND MEDIA GATEWAY SERVER

- A. The Core and Media Gateway (CMG) server shall be an integrated hardware and software platform that serves as the system management component and provides gateway functionality when accessing the security platform from external networks.
- B. The CMG server shall utilize a reliable SSD drive for the operating system drive to protect against hard disk drive failures from interrupting system functionality.
- C. The CMG server shall function as a key server for user and device authentication.
- D. The CMG server shall store and administer secure, private keys for cameras and video encoders to authenticate video recorded from those devices.
- E. The CMG server shall manage user rights and permissions, authenticating user credentials, maintaining directories of user rights across the system, logging user actions on the system, and managing password expiration and recovery options.

- F. The CMG server shall support LDAP to associate users in a Microsoft Active Directory with a user and role within the VMS.
- G. The CMG server shall act as a web server for web browser based access to video cameras and recorders on the network.
- H. The CMG server shall incorporate built-in transcoding of video to send video across low bandwidth network connections to remote browsers accessing cameras and recorders. The transcoder shall be capable of delivering MPEG4 and H.264 video streams into lower resolution, lower frame rate streams to fit the bandwidth limit established by the IT administrator or available on the network connection. The CMG server shall be capable of supporting up to 16 transcoded streams.
- I. The CMG server shall allow an administrator to determine which operators have remote access rights in addition to local access rights. Operators shall have access to the same cameras via the web browser as their permissions allow for on local clients. Remote access shall give an operator the ability to view the live streams from cameras in up to a 4x4 display, search and playback recorded video from the same cameras, and export clips of interest.
- J. The CMG server shall offer local storage of at least 1 TB for exported video.
- K. The CMG server shall maintain a system log of all user activity on the system including time and date of user log-in, log-off, configuration changes made, video exported.
- L. The CMG server shall store the database of device errors, alarms, and other system events, and the comprehensive database shall be accessed and searched through the system log window in an interface.
- M. The CMG server shall meet or exceed the following design and performance specifications:
 - 1. Power Input: 100 to 240 VAC, 50/60 Hz, auto ranging
 - 2. Power Consumption: 120 VAC: 160 W, 1.39 A, 547 BTU/H
 - 3. Operating Temperature: 10° to 35°C (32° to 95°F) at unit intake
 - 4. Operating Humidity: 20% to 80%, noncondensing
 - 5. Construction: Steel cabinet
 - a. Finish: Dark Gray
 - 6. Mounting: Rack – 2RU
 - 7. Processor: Intel® XEON™ E3-1275 v3
 - 8. Operating System: Microsoft® Windows® Server 2012
 - 9. User Interface: Web Interface
 - 10. Internal Memory: 32 GB DDR3 ECC
 - 11. Internal Storage Capacity
 - a. Operating System: 480 GB SSD
 - b. Export Footage Storage: 1 TB
 - 12. Network Ports: 2, 1 Gigabit Ethernet RJ-45 ports (1000Base-T)
- N. Basis of Design:
 - 1. Pelco Model Number E1-CMG-SVR-US or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORY SERVER

- A. The accessory server shall be synchronized to an external GPS network time server and act as a gateway for issuing the same time to all video security components on the network.
- B. The accessory server shall act as the DHCP server for the VMS. The server shall assign IP addresses and manage leases for automatic provisioning.
- C. The accessory server shall meet or exceed the following design and performance specifications:
 - 1. Power Input: 100 to 240 VAC, 50/60 Hz, auto ranging
 - 2. Power Consumption: 19.5 VDC: 65 W, 3.34 A, 222 BTU/H
 - 3. Operating Temperature: 5° to 35°C (41° to 95°F) at unit intake
 - 4. Operating Humidity: 20% to 80%, noncondensing
 - 5. Construction: Steel and plastic cabinet

- a. Finish: Black
 - 6. Mounting: Rack – 1RU
 - 7. Processor: Intel® CORE™ i7-4785T
 - 8. User Interface: Web Interface
 - 9. Internal Memory: 8 GB DDR3
 - 10. Internal Storage Capacity: 128 GB SSD
 - 11. Network Ports: 1 Gigabit Ethernet RJ-45 port (1000Base-T)
- D. Basis of Design
- 1. Pelco model number D09U-ACCSVR-US or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ENHANCED VIDEO DECODER

- A. The enhanced video decoder shall support any digital video stream on the network and allow for the decoding of up to sixteen (16) simultaneous streams from any camera, video encoder or recorder.
- B. The enhanced video decoder shall decode MPEG-4 and H.264 baseline, main, and high profile encoded video streams.
- C. The enhanced video decoder shall meet or exceed the following design and performance specifications:
 - 1. Power Input: 100 to 240 VAC, 50/60 Hz, auto ranging
 - 2. Power Consumption: 19.5 VDC: 65 W, 3.34 A, 222 BTU/H
 - 3. Operating Temperature: 5° to 35°C (41° to 95°F) at unit intake
 - 4. Operating Humidity: 20% to 80%, noncondensing
 - 5. Construction: Steel and plastic cabinet
 - a. Finish: Black
 - 6. Mounting: Rack – 1RU
 - 7. Processor: Intel® CORE™ i7-4785T
 - 8. User Interface: Web Interface
 - 9. Internal Memory: 8 GB DDR3
 - 10. Internal Storage Capacity: 128 GB SSD
 - 11. Network Ports: 1 Gigabit Ethernet RJ-45 port (1000Base-T)
- D. Basis of Design
 - 1. Pelco model number D09U-A1-DEC-US or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 STORAGE MANAGEMENT SERVER

- A. The SMS shall record video and audio streams from IP cameras and video encoders on the network.
- B. The SMS shall incorporate the server functions and storage elements into a purpose-built chassis.
- C. The SMS shall use RAID 6 parity across the storage drives to protect recorded data against a hard disk drive failure.
- D. The SMS shall only use enterprise-level hard disk drives specifically rated for operation in RAID systems.
- E. The SMS chassis shall be designed for video surveillance recording applications and encompass redundancy at all vital points:
 - 1. Redundant, hot swappable power supply modules
 - 2. Hot swappable hard drives
 - 3. Hot swappable O/S drive
 - 4. Hot swappable CPU fans
- F. The SMS shall support failover, allowing a SMS to act as a hot standby for any number of other, active SMSs.

- G. The SMS chassis shall be designed for online service and maintenance and cannot be removed from the rack when hard disk drives, fans, power supplies, or operating system drives must be replaced.
- H. The SMS shall support a guaranteed recording throughput of 350 Mbps per storage device with a minimum of 175 Mbps of read throughput. This throughput shall be guaranteed under normal and error (RAID rebuild) conditions.
- I. The SMS shall support the recording of MPEG-4 and H.264 baseline, and high profile streams from standard resolution and megapixel cameras.
- J. The SMS shall support continuous, scheduled, alarm/event (including analytics alarms), motion, and manual recording. Pre- and post-alarm periods shall be configurable.
- K. The SMS shall support bookmarking and locking/unlocking of video content on the drives.
- L. The SMS shall support privacy tools that allow administrators to establish maximum retention times for normal, alarm, and locked video.
- M. The SMS shall have the ability to report all diagnostic events, including software status diagnostics to a centralized user interface. In addition, Simple Network Management Protocol (SNMP) traps shall be available for monitoring through a third-party SNMP management console.
- N. The SMS shall be fully managed from a remote workstation, including the ability to configure settings and update firmware and software.
- O. The SMS shall meet or exceed the following design and performance specifications:
 - 1. Power Input: 100 to 240 VAC, 50/60 Hz, auto ranging
 - 2. Power Consumption: 120 VAC: 414 W, 3.45 A, 1411 BTU/H
 - 3. Operating Temperature: 10° to 35°C (32° to 95°F) at unit intake
 - 4. Operating Humidity: 20% to 95%, noncondensing
 - 5. Construction: Steel cabinet
 - a. Finish: Dark Gray
 - 6. Mounting: Rack – 3RU
 - 7. Processor: Intel® XEON™ E3-1276 v3
 - 8. Operating System: Microsoft® Windows® Server 2012
 - 9. User Interface: Web Interface
 - 10. Internal Memory: 32 GB DDR3 ECC
 - 11. Internal Storage Capacity:
 - a. Operating System: 200 GB SSD
 - b. Storage (HDD): Up to 96 TB
 - 12. Network Ports: 2, 1 Gigabit Ethernet RJ-45 ports (1000Base-T)
- P. Basis of Design
 - 1. Pelco model number E1-VXS-XX-US or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 CLIENT WORKSTATION

- A. The workstation shall be a high end personal computer with two monitor outputs, USB keyboard, and mouse.
- B. The workstation shall use a graphical user interface and keyboard/mouse that runs on Microsoft Windows 7 Ultimate for monitoring live and recorded video, and virtual matrix functionality that shall allow operators to see and respond to any alarm from any device on the network as well as direct any camera to any monitor on the network.
- C. The workstation shall allow administrators to configure devices, set up users, adjust network settings, and create recording schedules. Permission to access these functions and all other system services shall be configured to a fine level of detail including the ability to restrict cameras from viewers, restrict PTZ operation, allow or restrict digital zoom, Zone of Interest operations, or the ability to configure maps. In addition, user permissions shall allow for designated users to receive

and respond to alarm and system diagnostic messages. Administrators shall have the ability to prioritize user access to PTZ cameras.

- D. The workstation shall have advanced search capabilities, event logging, and alarm interface displays. The workstation shall export video and still images in multiple formats, including Pelco Native, AVI, BMP, and JPG. The unit shall provide a front panel USB port and DVD/CD-RW drive to make it capable of exporting video clips and still images to external media. Authentication software shall be exported automatically for any Pelco native exports.
- E. The workstation shall allow users with authority to monitor content from standard resolution and megapixel resolution cameras and encoders throughout the network. The workstation shall display content encoded in MPEG-4 and H.264 baseline, main, and high profiles. The workstation shall support cameras from multiple manufacturers.
- F. The workstation shall support CCTV-style (joystick) keyboard control of Pan/Tilt/Zoom (PTZ) cameras and camera call-up.
- G. The workstation shall detect the monitor's native resolution; provide users with single, 2 x 2, 3 x 3, 4 x 4, 1 + 5, 1 + 12, 2 + 8 displays for 4:3 aspect ratio monitors, and provide 3 x 2 and 4 x 3 displays for 16:9 aspect ratio monitors.
- H. The workstation shall retain the camera's aspect ratio and allow mixing standard resolution and megapixel resolution cameras on the same display.
- I. The workstation shall allow any combination of live or playback video on the same monitor at the same time. The workstation shall provide time-synchronized playback of up to 9 cameras simultaneously.
- J. The workstation shall provide digital zoom capability for any camera in live or playback mode.
- K. The workstation shall provide a Zone of Interest feature that can generate up to six independently controlled and zoomed images from a single image and allow operators to maintain a panoramic view of the scene while closely monitoring selected areas. This shall be accomplished without requiring additional network throughput.
- L. The system shall be capable of customizing the display area to suit user preferences. All aspects of the graphical user interface shall be capable of being resized, torn-off and moved to other monitors, or simply hidden. The system shall allow up to 6 customizable workspaces to be created and loaded with camera groups to facilitate easy and efficient monitoring. The system shall allow for up to two detachable video display windows to accommodate up to a 16 camera display.
- M. The workstation shall automatically load a user's language preferences, camera groups, and screen configurations upon log on.
- N. The workstation shall notify designated operators of all alarms on the system in an alarm tab. Video thumbnails shall be available for visual verification within the alarm monitoring workspace. The system shall allow alarms to be acknowledged or snoozed by the operator. The workstation application shall support the functionality to view procedures and instructions for given alarms triggered to appear during alarm events, while generating detailed written or verbal instructions to the operator as to the actions to be taken. An operator shall have the capability of entering his or her own feedback to the given alarm. All user alarms and user actions shall be kept in the system log for audit purposes.
- O. The workstation application shall provide the ability to control and program any camera equipped with PTZ. The workstation shall be capable of the following operations:
 - a. Manually control the PTZ
 - b. Set the pan/tilt home positions for manual or alarm activation
 - c. Automatically control the cameras through an alarm trigger
 - d. Ability to set multiple preset positions
 - e. Ability to set multiple tours
 - f. Remotely set and clear the movement limits of the pan/tilt mechanism from the control room, through a telemetry unit at an outdoor camera site
 - g. Adjust the zoom lens

- h. Ability to control the camera menu and set up the camera through the IP video security system
- P. The workstation shall meet or exceed the following design and performance specifications:
 - a. Power Input: 100 to 240 VAC, 50/60 Hz, auto ranging
 - b. Power Consumption: 120 VAC: 160 W, 1.39 A, 547 BTU/H
 - c. Operating Temperature: 10° to 35°C (32° to 95°F) at unit intake
 - d. Operating Humidity: 20% to 80%, noncondensing
 - e. Construction: Steel cabinet
 - 1) Finish: Dark Gray
 - f. Mounting: Rack – 2RU
 - g. Processor: Intel® XEON™ E3-1275 v3
 - h. Operating System: Microsoft® Windows® 7 Ultimate
 - i. User Interface: Web Interface
 - j. Internal Memory: 8 GB DDR3 Non-ECC
 - k. Internal Storage Capacity
 - 1) Operating System: 120 GB SSD
 - l. Network Ports: 2, 1 Gigabit Ethernet RJ-45 ports (1000Base-T)
- Q. Basis of Design
 - 1. Pelco E1-OPS-WKS-US or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 JOYSTICK CONTROLLER / KEYBOARD

- A. The keyboard shall be compatible with all viewing stations.
- B. The keyboard controls are located on three modules in the keyboard. Modules shall be capable of rotating to suit user preferences. The keyboard modules shall include a variable speed, vector-solving joystick for precise PTZ control, jog/shuttle for playback control and pattern control, a keypad for camera and monitor control, and a built-in speaker. The keyboard shall have LED buttons that work in conjunction with the feature being used.
- C. The keyboard shall be part of an integrated system and shall be configured so any number of keyboards can be added to the system.
- D. The keyboard shall meet or exceed the following design and performance specifications:
 - 1. Keyboard Interface: USB 2.0
 - 2. Input Voltage: 12 VDC
 - 3. Input Current: 1.3 A (maximum)
 - 4. Upstream Port: USB 2.0
 - 5. Audio Output: Embedded speaker or plug-in headset, 0.5 W into 8-ohm load per channel
 - 6. Audio Input: Plug-in microphone, mono (30 to 350mVp-p); or line input, stereo (0.35 to 2.0 Vp-p).
 - 7. Keyboard Keypad: 0-9, camera, monitor, and multiple view keys
 - 8. Joystick: Fully proportional PTZ, variable speed; with zoom, iris, and focus controls
 - 9. Jog/Shuttle: Proportional, fast forward, reverse, and video transport; menu navigation on VCD5000 video console display
 - 10. Operating Temperature: 32° to 104°F (0° to 40°C) at air intake of unit
 - 11. Operating Humidity: Up to 96%
- E. Basis of Design
 - 1. Pelco KBD5000-Series, Joystick/Keyboard or approved substitution
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 NETWORK VIDEO ENCODERS

- A. The video encoder shall be standards-compliant and provide a fully supported API that shall integrate with multiple video management systems.
- B. The video encoder shall support 1, 4, 8 or 16 camera inputs.

- C. The video encoders shall generate compressed MJPEG and H.264 video streams in standards-compliant baseline profile, main profile, or high profile.
- D. The video encoder shall provide for two independently configurable streams for each camera input. Each stream shall be capable of 4CIF resolution, 30 images per second, NTSC. The settings of one stream shall not interfere or limit the settings for the second stream.
- E. The video encoder shall be capable of generating 4CIF resolution, real-time video streams while also running intelligent video content analysis algorithms on each camera input. There shall be no need to degrade video resolution or frame rate to execute analytics algorithms.
- F. The video encoders shall be conformant to ONVIF Profile S and support open standards-based architecture best practices with published API available to third-party network video recording and management systems.
- G. The video encoder shall use a standard web browser interface for remote administration and configuration of encoder and camera settings.
- H. The video encoder shall meet or exceed the following design and performance specifications:
 - 1. Video Standards: NTSC/PAL
 - 2. Video Encoding: MJPEG and H.264 Baseline, Main, and High profiles
 - 3. Video Streams: 3 independently configurable per video channel
 - 4. Video Frame Rates: Up to 30 per second per channel
 - 5. Max Video Resolution: D1 - 720x480
 - 6. Network Protocols: TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, LDAP, DNS, DHCP, RTP, RTSP, NTP, IPv4, SNMP v2c/v3, QoS, HTTP, HTTPS, SSH, SSL, SMTP, and 802.1x (EAP)
 - 7. Video Input: BNC, 1Vp-p $\pm 10\%$; Hi-Z / 75 ohms
 - 8. Audio
 - a. Audio Encoding: G.711 speech codec
 - b. Audio Bit Rate: 64 kbps
 - c. Audio Input Connector: Line-in 3.5 mm
 - d. Audio Inputs: 1 per video channel
 - 9. Network Interface: RJ-45 100/1000 Mbps
 - 10. Input Power: 12VDC or PoE 802.af (single channel only)
 - 11. Alarm Inputs: 1 per video channel
 - 12. Relay Outputs: 1 for every 4 video inputs
 - 13. Analytics: Motion and Sabotage
 - 14. PTZ Interfaces: Coaxitron, RS-422, RS-485
 - 15. PTZ Protocols: Pelco D, Pelco P, Coaxitron, Extended Coaxitron
 - 16. Indicators
 - a. Power: Green
 - b. Status: Green, amber, red
 - c. Ethernet: Green, amber, red
 - d. Video: Green, red, off
 - 17. Operating Temperature: 0° to 50°C (32° to 122°F)
 - 18. Operating Humidity: 0% to 80%, noncondensing
- I. Basis of Design
 - 1. Pelco NET5500 Series or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.09 32" HD LED MONITOR

- A. The flat panel LED monitor shall have performance-enhancing features such as VGA, HDMI inputs, looping BNC output, and HD resolution.
- B. The flat panel LED monitor shall provide a front panel that allows the user to adjust image quality, brightness, size, position, and geometry for optimal viewing.

- C. The flat panel LED monitor shall meet or exceed the following design and performance specifications:
1. Brightness: 300 cd/m2 (typical)
 2. Control Ratio: 3000:1
 3. Backlight Type: LED
 4. Refresh Rate: 60, 70, 75 Hz (depending on resolution)
 5. Viewing Angle (H/V): 178°/178°
 6. Response Time: 6.5 ms
 7. Native Resolution: 1920 x 1080
 8. Panel Aspect Ratio: 16:9 or 4:3
 9. Video Formats: 480p, 1080i, 1080p
 10. Panel Life: 40,000 hours
 11. Display Colors: 16.7 million
 12. Speakers: 2, internal (10 W, 4 ohms x 2)
 13. Front Panel Controls: Menu, source, down/up, left/right, power
 14. Indicators: LED (power on/off)
 15. Power Consumption: <55 W
 16. Input Voltage: 100 to 240 VAC, 50/60 Hz
 17. Input/Output Interfaces: Video 1 BNC, looping; 2 HDMI; 1 VGA
 18. Audio: 3.5 mm stereo jack
 19. Sync Format: NTSC/PAL
 20. Operating Temperature: 0° to 40°C (32° to 104°F)
 21. Operating Humidity: 10% to 85%, noncondensing
- D. Basis of Desing
1. Pelco PMCL632 or approved substitution.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.10 NETWORK DOME PTZ CAMERA (2MP PTZ)

- A. The network dome PTZ camera shall be a discreet camera dome system consisting of a dome drive with a variable speed/high speed pan/tilt drive unit with continuous 360° rotation up to 400°/sec.
- B. The network dome PTZ camera shall offer multiple simultaneous video streams with 2.1 megapixel (MPx) 1920 x 1080 resolution, auto iris with 20X or 30X optical, and 12X digital zoom.
- C. The network dome PTZ camera shall be conformant to the ONVIF Profile S and Profile G and support open architecture best practices with a published API available to third-party network video recording and management systems.
- D. The network dome PTZ camera shall provide the ability to backup and restore camera settings, perform firmware upgrades, multiple zoom and autofocus capabilities through a Web browser interface.
- E. The network dome PTZ camera shall meet or exceed the following design and performance specifications:
1. Sensor Type: 1/2.8-inch Type Exmor CMOS sensor
 2. Lens Optical Zoom: 20X or 30X
 3. Digital Zoom: 12X
 4. Maximum Resolution: 2 MPx (1920 x 1080)
 5. Light Sensitivity: Down to 0.008 lux – mono mode, 250ms
 6. Day/Night Capabilities: Yes
 7. IR Cut Filter: Yes
 8. Wide Dynamic Range: 130 dB
 9. Iris Control: Auto iris with manual override
 10. Backlight Compensation: Yes
 11. Automatic Gain Control: Yes
 12. Active Noise Filtering: Yes

13. Electronic Image Stabilization (EIS): Yes
 14. Video Encoding: H.264 in High, Main, or Base profiles and MJPEG
 15. Frame Rate: 1 to 60 fps
 16. Supported Protocols: TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, SSH, SSL, SMTP, FTP, and 802.1x (EAP)
 17. Network Port: RJ-45 for 100Base-TX, Auto MDI/MDI-X
 18. Input Voltage: 24 VAC, 24 VDC, PoE+ and HPoE
 19. Input Power
 - a. 24 VAC: 24 VA nominal (without heater and blower); 81 VA nominal (with heater and blower)
 - b. 24 VDC: 1 A nominal (without heater and blower); 3 A nominal (with heater and blower)
 - c. PoE+: 18 W, Environmental models (with heater on); 15 W, Non-Environmental (with heater off)
 - d. HPoE: 60 W, Environmental models (with heater on); 15 W, Non-Environmental (with heater off)
 20. Alarm Inputs: 1
 21. Alarm Output: 1
 22. Audio
 - a. Input/Output: Line level/external microphone input; 600-ohm differential, 1 Vp-p maximum signal level
 23. Pan Movement: 360° continuous pan rotation
 24. Analytics: Adaptive motion, sabotage, abandoned object, directional motion, loitering detection, object counting, object removal, stopped vehicle, auto tracker
 25. Pan Speed: Variable between 280° per second continuous pan to 0.1° per second
 26. Maximum Pan Speed: 430° per second
 27. Vertical Tilt: Unobstructed tilt of +1° to -90°
 28. Manual Control Speed: Pan speed of 0.1° to 80° per second; tilt operation shall range from 0.1° to 45° per second
 29. Automatic Preset Speed: Pan speed of 280° and a tilt speed of 160° per second
 30. Presets: 256 positions
 31. Tours: 16 tours
 32. Proportional Pan/Tilt Speed: Speed decreases in proportion to the increasing depth of zoom
 33. Window Blanking: 32 blanked windows
 34. Auto Flip: Rotates dome 180° at bottom of tilt travel
 35. Operating Temperature: Maximum temperature range of -51°C to 60°C (-60°F to 140°F) for two hours and a continuous operating range of -45°C to 50°C (-50°F to 122°F)
 36. Operating Humidity: 10 to 100% RH (condensing)
 37. Construction: Aluminum housing with acrylic lower dome; NEMA4X and IP66 rated
 38. Dome: Smoked or Clear
- F. Basis of Design
1. Pelco S6220-Series or S6230-Series Network Dome Positioning System or approved substitution.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.11 NETWORK DOME CAMERA (2 MEGAPIXEL)

- A. The network dome camera shall offer multiple simultaneous video streams with 2.1 megapixel (1920 x 1080) resolution, auto iris and varifocal lens.
- B. The network dome camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.
- C. The network dome camera shall feature an unsupervised alarm input, relay output and line level/external microphone input connections.

- D. The network dome camera shall support two simultaneous, configurable video streams. H.264 and MJPEG compression formats shall be available for primary and secondary streams with selectable Unicast and Multicast protocols.
- E. The network dome camera shall be conformant to the ONVIF Profile S supporting open architecture best practices with a published API available to third-party network video recording and management systems.
- F. The network dome camera shall provide the ability to backup and restore camera settings, perform firmware upgrades, multiple zoom and autofocus capabilities through a Web browser interface.
- G. The network dome camera shall meet or exceed the following design and performance specifications:
 - 1. Imaging Sensor: 1/2.8-inch CMOS Sensor
 - 2. Maximum Resolution: 2.1 MPx (1920 x 1080)
 - 3. Wide Dynamic Range: Up to 75 dB
 - 4. Sensitivity: Down to 0.03 lux – mono mode, 200ms, f/1.2
 - 5. Day/Night Capabilities: Yes
 - 6. Mechanical IR Cut Filter: Yes, (ON/OFF/AUTO selectable)
 - 7. Lens Type: Varifocal 3-10.5 mm
 - 8. Focus: Autofocus, motorized
 - 9. Frame Rate: 1 to 30 fps
 - 10. Video Encoding: H.264 High or Main profiles and MJPEG
 - 11. Window Blanking: 4 configurable windows
 - 12. Supported Protocols: TCP/IP, UDP, ICMP, IPv4, SNMP v2c/v3, HTTP, HTTPS, SSL, SSH, SMTP, FTP, RTSP, UPnP, DNS, NTP, RTP, RTCP, LDAP
 - 13. Network Port: RJ-45 for 100Base-TX, Auto MDI/MDI-X
 - 14. Input Power: 24VAC, PoE (IEEE802.3af, Class 3)
 - 15. Power Consumption: <6W Indoor;<16W Outdoor (with heater ring)
 - 16. Alarm Inputs: 1
 - 17. Alarm Outputs: 1
 - 18. Audio
 - a. Input/Output: Line-in/Line-out/terminal block
 - b. Compression: G.711 A-law / G.711 U-law
 - 19. Analytics: Simple motion and sabotage
 - 20. Dome: Clear - Zero light loss
 - 21. Construction: IP66 ingress protection; IK10 (20J) impact resistance
 - 22. Operating Temperature: -40° to 55°C (14° to 131°F)
 - 23. Operating Humidity: 5 to 90%, RH condensing
- H. Basis of Design
 - 1. Pelco IMP221-1ES or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.12 ANALOG MINI DOME CAMERA (ANALOG - ELEVATOR)

- A. The mini dome camera system shall integrate a camera and lens package into a small enclosure that can be mounted directly to, or recessed into, a ceiling or wall.
- B. The mini dome camera system shall have a high resolution (540 TVL) color camera with auto iris and varifocal lens.
- C. The mini dome camera shall have manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.
- D. IP encoders shall be provided as needed to convert the analog signal from the camera to IP.
- E. The outdoor mini dome camera system shall meet or exceed the following design and performance specifications:
 - a. Construction: Aluminum die cast

- b. Dome: Clear Polycarbonate
 - c. Image Sensor: 1/3-inch interline transfer CCD
 - d. Effective Pixels: 976 (H) x 494 (V)
 - e. Horizontal Resolution: 650 TV lines
 - f. Minimum Illumination: 0.1 lux (color mode); 0.1 lux (B-W mode)
 - g. Dynamic Range: Adaptive black stretch
 - h. Day/Night Type: Simple
 - i. Video Output: 1.0 Vp-p, NTSC composite, 75 ohms, BNC connector
 - j. White Balance: Autotracking white balance/automatic white balance control
 - k. Signal-to-Noise Ratio: 52 dB (equivalent to AGC off, weight on)
 - l. Lens: Varifocal lens 3-9mm
 - m. Power: 24 VAC or 12VDC
 - n. Power Consumption: 2.7W without heater; 13.1W with heater
 - o. Environment: Outdoor/Indoor
 - p. Ambient Temperature
 - 1) Without Heater: 14° to 122°F (–10° to 50°C)
 - 2) With Heater: –22° to 122°F (–30° to +50°C)
 - q. Ambient Humidity: Less than 90%
- F. Basis of Design
- 1. Pelco FD5-V9-6 or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.13 ANALOG INTERCOM STATION CAMERA

- A. The analog intercom station camera shall be mounted in a modified Quam CIS2/25 vandal resistant intercom station.
- B. The camera shall be a color camera with a resolution of 700 TVL.
- C. IP encoders shall be provided as needed to convert the analog signal from the camera to IP.
- D. The outdoor mini dome camera system shall meet or exceed the following design and performance specifications:
- 1. Image Sensor: 1/4-inch interline transfer CCD
 - 2. Effective Pixels: 768 (H) x 494 (V)
 - 3. Horizontal Resolution: 700 TV lines
 - 4. Minimum Illumination: 0.5 lux (color mode)
 - 5. Video Output: 1.0 Vp-p, NTSC composite, 75 ohms, BNC connector
 - 6. Lens: Fixed 1.5 mm
 - 7. Power: 12VDC
 - 8. Power Consumption: <1W
 - 9. Environment: Outdoor/Indoor
 - 10. Ambient Temperature: 14° to 122°F (–10° to 50°C)
 - 11. Ambient Humidity: Less than 90%
- E. Basis of Design
- 1. Enforcer EV-5105-N1SQ or approved substitution.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.14 CAMERA HOUSINGS, SUPPORTS AND ACCESSORIES

- A. Provide all accessories to accomplish the specified mount according to the camera schedule.
- B. All cameras shall be mounted with required housings for a complete installation. All housings must be vandal resistant.
- C. Wall mounted cameras shall be provided with appropriate mounting arms and brackets.
- D. All camera back boxes in plenum areas shall be plenum rated per the NEC.

- E. Provide all necessary fiber media converters for cameras designated to use fiber cabling in the camera schedule. Fiber media converters at camera locations shall be located within the camera housing/bracket or a separate NEMA 4X enclosure. Rack mounted fiber media converters shall be provided at head end locations.
- F. Provide 24VAC power supplies as required to provide power to all cameras using fiber cabling. Power supplies shall be rack mounted and each output must be isolated and individually fused.

PART 3 EXECUTION

3.01 GENERAL

- A. All video signals from cameras in the system shall be home run to closest security equipment room. Video signal cable shall be CAT6 cable. The contractor shall ensure video signal integrity against loss or attenuation and provide clean roll free switching.
- B. All work required herein shall comply with applicable sections Division 28 requirements.
- C. Final code and local requirements for all security related equipment is the responsibility of the contractor and vendors. This includes but is not limited to National Electric Code, ANSI standards, ADA requirements, state and local codes and others required.
- D. Cameras located in inmate cells shall be mounted as close as possible to the corner of the cell and towards the ceiling to obtain the greatest possible view of the room.
- E. All cameras are to be installed per the manufacturer requirements.

END OF SECTION

This page intentionally left blank

**SECTION 28 30 00
ACCESS CONTROL SYSTEM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements and operational characteristics for an Access Control System (ACS), which is an integral part of the SCS.
- B. Provide all labor, equipment, materials, and supervision to install, program, calibrate, adjust, document, and test the total system as required here in and on the drawings.

1.02 SYSTEM DESCRIPTION

- A. Provide a facility-wide ACS, which is fully integrated with the SCS. The manufacturer of the Access Control System shall be the PLC manufacturer (see Section 28 00 10). The ACS shall be UL 294 listed.
- B. Where shown on the documents, provide ACS devices as specified. Tokens shall consist of proximity cards and tags. Upon presenting a valid token, the system shall grant access to a controlled device or resource.

1.03 INTEGRATION REQUIREMENTS

- A. The ACS shall have the following integration requirements to allow for seamless control and future flexibility:
 - 1. The ACS's database shall be fully integrated with the database of the Security Management Server (SMS), allowing the token user's name, not ID code, to be logged by the SMS upon any use of a token reader. The system shall log all access control events. All access control events shall be associated with the token user's name.
 - 2. The ACS's database (located on the SMS), shall be capable of a minimum of 25,000 user accounts. The ACS shall be capable of supporting 1000 client licenses.
 - 3. The ACS shall be a robust, user-friendly, easily expandable solution. Users shall be added, modified, and deactivated using a Windows-based GUI interface. Each user shall be given customized access rights to controlled devices and other resources based on the time of day, day of the week, and restricted dates. In addition, users must be able to be assigned to customized user groups, which system administrators shall be able to create in order to streamline the access management process and tailor it to their own needs.
 - 4. The ACS shall integrate seamlessly with the SCS to visually alert operators when a door has been accessed via the token reader system and shall allow control station operators to isolate (disable) individual token readers to prevent access (reference section 17020 for control station functionality). The SMS shall be able to log requests at doors with an isolated reader. Token users shall be capable of entering proximity reader/keypads, which shall activate at that location on one or more control stations. The same level of integration shall also be seen on the SMS, which shall record the user's name and time when a resource is accessed, and shall include a full range of reporting features. Login to the Access Control software shall be password protected and access shall be logged to the SMS.
 - 5. The ACS shall prompt a response of the opening of any doors. It shall make door open requests of the PLC System. The PLC System shall verify interlocking of the requested door and status of the token reader prior to any unlocking.
 - 6. The system shall also have a Windows-based help system.

1.04 SYSTEM FEATURES

- A. User Configuration Functions: A user shall include any individual that uses the ACS to access resources, such as a door, software application, or control station. A user shall also include an administrator who is using the access client software to add users and set permissions and rules. User configuration functions shall include the following:
 - 1. Creating a New User
 - a. Provide a User Configuration screen that shall allow the operator to create a new user or display information about current users. The information fields displayed shall include the

- flowing; Last Name, First Name, Middle Name and ID Number. The ID Number shall be any combination of letters and numbers up to a maximum of 50 characters.
- b. An image shall be capable of being associated with a user and stored in the SMS database for retrieval from the client software or control station(s).
2. Modify a User (Searching)
 - a. Provide a means to modify information about existing users.
 - b. Provide a User Search dialog box that, by default, displays all active users in the database. The User Configuration screen for each user shall be displayed upon the selection of a user in the database.
 - c. Provide a means to facilitate a more refined search. The operator shall be capable of selecting a field (i.e. Last Name, First Name, ID Number, token, etc.) to search on a "Search" list and typing the desired text in a "For" box. The operator shall also be capable of searching for deactivated accounts by means of a checkbox selection.
 3. Acquiring an Image for a User
 - a. Provide a means to capture an image and associate it with an individual user in the database.
 - b. Provide an Image Acquire screen that shall allow an operator to capture an image via an image capture device (i.e. USB camera).
 - c. Provide a preview window that displays a live video stream.
 - d. Provide an Image Capture button for the operator to select once the user is positioned properly in the preview window. Once picture is acquired, it is saved directly to the user's record.
 - e. Provide an Import Image screen that shall allow an operator to import an existing image. Provide a window for the operator to browse to an existing image and open the image once it is found.
 4. Assigning a User to User Groups
 - a. Provide a means to allow users to be assigned to User Groups. A User Group shall be defined as a specific group of users who share the same permissions and rules. When a user is assigned to a group, they shall receive the same permission and rules that the group has, in addition to their own individual permissions and rules. Users shall be capable of belonging to more than one user group.
 5. Assigning Rules to a User
 - a. Provide a means to assign rules to a user. Assigning rules to a user shall allow the user's permissions to be restricted to specific days of the week, as well as specific times of the day. Provide a means to have a user's access to activate or expire on a specific day or prevent them from using permissions on restricted dates.
 - b. Provide an 'Allow access only during time range' checkbox for users that are allowed access only during specific times. Provide time configuration boxes for 'No earlier than' and 'No later than' that include the time in hours, minutes and seconds. Provide indications for "AM" and "PM".
 - c. Provide an 'Unrestricted Access' setting to select for users that have no access restrictions based on the time of the day and the day of the week.
 6. Assigning Tokens to a User
 - a. Provide a means to assign tokens to a user. Assigning tokens to a user consists of assigning items such as a PIN code, proximity card number, password, etc. that the ACS uses to identify a user.
 - b. Provide a Proximity Card field that shall be used to assign a proximity card ID number to the user. For this feature, a proximity reader enrollment station may be used. The operator shall activate an Enroll button and swipe a proximity card at the enrollment reader. The proximity ID will appear in the field when the card is read.
 - c. Provide a Personal Identification Number field that shall be used to assign a unique number to a user for use with proximity readers with a keypad option. Upon correct entry of a personal identification number at a keypad, the user shall be up to a maximum of 12 digits long, and unique for all users.

7. Creating a New User Group
 - a. Provide a means to create User Groups, which shall allow the operator to easily assign the same permissions and rules to many users.
 - b. Provide a Group Configuration screen that shall allow the operator to create a new group or display information about current groups.
8. Assigning Permissions to a User Group
 - a. Provide a means to allow user groups access to system resources.
9. Assigning Rules to a User Group
 - a. Provide a means to assign rules to user groups. Assigning rules to a user group shall allow the user group's permissions to be restricted to specific days of the week, as well as specific times of the day. Provide a means to have a user group's access to activate or expire on a specific day or prevent the group from using permissions on restricted dates.
10. Assigning Users to a User Group
 - a. Provide a means to assign users to user groups. When a user is assigned to a user group, they receive the permissions and rules of the user group.
11. Adding/Modifying/Deleting Restricted Dates
 - a. Provide a Restricted Dates screen that shall allow the administrator to create new, modify existing, or delete existing restricted dates. Restricted Dates shall be defined by the administrator on this screen. The administrator shall be capable of assigning a name, as well as a date for the restricted date on this screen. A minimum of 1000 administrator-definable restricted dates shall be available.
 - b. Once defined, access on restricted dates shall be granted by going to the assign Rules tab within the User Configuration screen, and checking the 'Allow access on restricted dates' checkbox.
12. Badge Designer: The system shall have the following Badge Designer features:
 - a. Badge Designer Basics: This tool shall be used to create custom badge templates. A badge template can then be assigned to any number of users in order to print custom user badges. The badge designer shall be capable of creating templates for use with badges with similar requirements.
 - b. Badge Printing: This tool shall be used to allow for edge-to-edge card printing.

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. Proximity Reader (standard mount)
 1. Dimensions: 3.3"W x 4.8"H x 1.0"D
 2. Read Range: 4.5" (typical)
 3. Material: Polycarbonate UL 94
 4. Power Supply: 5-16 VDC
 5. Current Requirements: Average—85mA (12VDC), Peak—200mA (12VDC)
 6. Operating Temperature: -31° to 150°F (-35° to 65°C)
 7. Operating Humidity: 5%-95% relative humidity, non-condensing
 8. Environmental Rating: Indoor/Outdoor IP55
 9. Transmit and Excite Frequency: 13.56 MHz and 125 KHz
 10. Provide one proximity reader per enrollment station.
 11. Basis of Design:
 - a. HID Corp. model RP40 or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Proximity Reader (mullion mount)
 1. Dimensions: 1.9"W x 4.1"H x 0.9"D
 2. Read Range: 2.5" (typical)
 3. Material: Polycarbonate UL 94
 4. Power Supply: 5-16 VDC
 5. Current Requirements: Average—75mA (12VDC), Peak—200mA (12VDC)

6. Operating Temperature: -31° to 150°F (-35° to 65°C)
 7. Operating Humidity: 5%-95% relative humidity, non-condensing
 8. Environmental Rating: Indoor/Outdoor IP55
 9. Transmit and Excite Frequency: 13.56 MHz and 125 KHz
 10. Basis of Design
 - a. HID Corp. model RP10 or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Proximity Reader (standard with keypad)
1. Dimensions: 3.3"W x 4.8"H x 1.1"D
 2. Read Range: 4.5" (typical)
 3. Material: Polycarbonate UL 94
 4. Power Supply: 5-16 VDC
 5. Current Requirements: Average—95mA (12VDC), Peak—200mA (12VDC)
 6. Operating Temperature: -31° to 150°F (-35° to 65°C)
 7. Operating Humidity: 5%-95% relative humidity, non-condensing
 8. Environmental Rating: Indoor/Outdoor IP55
 9. Transmit and Excite Frequency: 13.56 MHz and 125 KHz
 10. Keypad Type: 4x3
 11. Basis of Design
 - a. HID Corp. model RPK40 or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Proximity Access Cards
1. Dimensions: 2.125"W x 3.375"H x 0.033"D
 2. Construction: Thin, flexible PVC laminate
 3. Operating Temperature: -50° to 160°F (-45° to 70°C)
 4. Provide 200 cards to Owner upon final completion.
 5. Basis of Design
 - a. HID model 2021BGGMVM or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Proximity Access Key Fob
1. Dimensions: 1.555"W x 1.25"H x 0.235"D
 2. Construction: Ultrasonically welded ABS Shell with TPE insert
 3. Operating Temperature: -50° to 160°F (-45° to 70°C)
 4. The proximity access cards shall be a HID model 2051PNNMN.
 5. Provide 100 key fobs to Owner upon final completion.
 6. Basis of Design
 - a. HID model 2051PNNMN or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Pushbutton Request to Exit Station
1. The pushbutton shall have a mushroom style head with a diameter of 1-9/16".
 2. The pushbutton shall be a momentary, dry contact switch.
 3. The pushbutton shall be mounted on a single gang, stainless steel plate with "PUSH TO EXIT" engraved on the plate.
 4. The pushbutton shall be connected to an input of the PLC system. The pushbutton shall not be connected directly to the door lock.
 5. Basis of Design
 - a. Dortronics Systems, Inc. model 5211-MP23/R or approved substitution.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Serial Device Servers
1. Proximity readers and other token readers shall interface to the security network via serial devices servers.

2. Provide serial device servers that meet the following specifications:
 - a. Wiegand Interface: 26 or 32 bit
 - b. Wiegand Readers: Support up to eight (8) wiegand readers
 - c. Serial Interface: MTI Data Loop
 - d. Power Requirements: Power input: 12VDC; Power Consumption: 200mA
 - e. Board shall be capable of supplying power to all eight readers
 - f. Environmental Specifications: Operating Temperature: 32 to 112°F (0 to 55°C), 5 to 95% RH;
 - g. Basis of Design
 - 1) MTI 81222C with an 81611 module or approved substitution.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
 3. Provide quantity of serial device servers to interface to all proximity readers, proximity/keypad readers and other token readers as shown on the plans or as required.
- H. Single-sided Card Printer
1. General Specifications:
 - a. 130 cards/hour full color, single-sided (YMCKO)
 - b. 545 cards/hour monochrome, single-sided
 - c. Edge-to-edge printing on standard CR-80 medi
 - d. Color dye sublimation or monochrome thermal transfer printing
 - e. 100 card covered feeder
 - f. 300 dpi print resolution
 2. Electrical/Mechanical Specifications:
 - a. 90~130 Volts AC, 50~60 Hz (auto switching)
 3. Environmental:
 - a. Operational Temperature: 60°F to 86°F (15°C to 30°C)
 - b. Operating Humidity: 20% to 65% non-condensing
 4. Provide two full color print ribbons with capacity of printing 200 images (each).
 5. Basis of Design
 - a. HID model 2051PNNMN or approved substitution.
 - b. The card printer shall be a Zebra ZXP Series
- I. Dual-sided Card Printer
1. General Specifications:
 - a. 140 cards/hour full color, single-sided (YMCKO)
 - b. 195 cards/hour full color, dual-sided (YMCKOK)
 - c. Edge-to-edge printing on standard CR-80 media
 - d. Color dye sublimation or monochrome thermal transfer printing
 - e. 100 card covered feeder
 - f. 300 dpi print resolution
 2. Electrical/Mechanical Specifications:
 - a. 90~130 Volts AC, 50~60 Hz (auto switching)
 3. Environmental:
 - a. Operational Temperature: 60°F to 86°F (15°C to 30°C)
 - b. Operating Humidity: 20% to 65% non-condensing
 4. Provide two full color print ribbons with capacity of printing 200 images (each).
 5. Basis of Design
 - a. HID model 2051PNNMN or approved substitution.
 - b. The card printer shall be a Zebra ZXP Series
- J. ACS Enrollment Station
1. The computer shall have the following minimum requirements:
 - a. Processor: Intel Core i7-6700, 3.4GHz, 8MB Cache, 4 Cores
 - b. Operating System: Windows 7 Professional 64 bit
 - c. Internal Memory: 8GB, DDR4, 2133 MHz

- d. Storage: 128GB Solid State Drive (SSD)
- e. Graphics Card: 2GB Dedicated RAM, Dual Outputs
- f. Network: Gigabit Ethernet Adapter
- g. Keyboard/Mouse: Wireless
- 2. Provide a 21.5" LCD flat panel monitor, equal to an HP 22uh or approved substitution.
- 3. Provide a 1200DPI printer, equal to an HP LaserJet Pro M402dn or approved substitution.
- 4. Provide a 20.1 megapixel digital camera equivalent to a Sony W830 or approved substitution and a compatible tripod with 3-way pan/tilt head adjustment.
- 5. The integrator shall install the ACS software on this PC. Provide MTI Card Access software or approved substitution.

PART 3 EXECUTION

3.01 GENERAL

- A. All work required herein shall comply with section 28 00 00 Security Control System.

END OF SECTION

**SECTION 28 50 00
AUXILIARY CONTROL SYSTEM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements and operational characteristics for an Auxiliary Control System, which is an integral part of the SCS.
- B. Auxiliary control system features included are:
 - 1. Motion Detectors
 - 2. Duress Switches
- C. Provide all labor, equipment, materials, and supervision to install, program, calibrate, adjust, document, and test the total system as required herein and on the drawings.

1.02 SYSTEM DESCRIPTION

- A. Provide a fully integrated PLC-based control system, which shall allow for the remote control of auxiliary systems of the facility.

1.03 SYSTEM REQUIREMENTS

- A. The Auxiliary Control System shall have the following system features and software requirements to allow for seamless control and future flexibility.
- B. Motion Detectors when activated shall indicate on the Touchscreen as an alarm input. The ICON shall flash and an audio tone sound until the alarm is acknowledged by clicking the silence button. The Tone will end, and the ICON will be on until the condition is removed and the reset button is clicked.
- C. Duress Switches when activated shall indicate on the Touchscreen as an alarm input. The ICON shall flash and an audio tone sound until the alarm is acknowledged by clicking the silence button. The Tone will end, and the ICON will be on until the condition is removed and the reset button is clicked. The duress switch will require a key to return the switch to a normal condition.
- D. Provide a complete and fully functional PLC control system using materials and equipment of types, sizes, and rating, as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- E. The relays and all components in the controller system shall be the product of a company who regularly manufactures and services this type of equipment and who meets the requirements listed above. All assemblies and sub-assemblies performing similar functions in separate controllers purchased under this specification shall be interchangeable.
- F. The PLC control system shall control 120 volt, 277 volt and low voltage relays as required for circuits called for to be controlled herein these specifications and/or as shown on drawings.
- G. Modular components of the system shall be UL listed or recognized.
- H. The programmable controller and low voltage relays shall be housed in remote relay cabinets.

PART 2 PRODUCTS**2.01 MOTION DETECTOR**

- A. Provide 360-degree passive infrared motion detector.
- B. Basis of Design
 - 1. Optec FX-360 or approved substitution.
 - 2. Substitutions: See Section 01 60 0 - Product Requirements.

2.02 DURESS SWITCH

- A. Provide a mushroom style duress switch. The switch when depressed shall require a key to return to normal position.

PART 3 EXECUTION

3.01 GENERAL

- A. All work required herein shall comply with section 28 00 00 Security Control System.

END OF SECTION

**SECTION 28 90 00
SECURITY MANAGEMENT SERVER****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. This section includes the requirements and operational characteristics for Security Management Server (SMS) comprised of the following equipment that is 100% integrated with the SCS.

1.02 SYSTEM DESCRIPTION

- A. The SMS data-recording engine shall log security commands made within the detention facility as they happen. The SMS shall provide facility administrators the ability to monitor and review all operational aspects of the SCS and its operations. The intent is that by recording all actions of the system, it shall provide owners with greater liability protection and system accountability.

1.03 SOFTWARE REQUIREMENTS

- A. The SMS shall have the following software requirements to allow for seamless control and future flexibility:
1. Data Logging
 - a. The integrator shall provide a SMS system with a single point for logging, recording, report generation and backup.
 - b. The SMS shall be capable of processing 500,000 transactions per day (minimum).
 - c. The SMS shall be capable of communication to multiple PLCs over Ethernet.
 2. Audio Logging
 - a. The SMS shall have the ability to record the audio conversations from each control station simultaneously to the SMS hard disk as a WAV or MP2 file.
 - b. Each audio recording shall include: Time/Date, control station user, control station, and field intercom station.
 - c. The transaction log shall provide an automated link for every intercom call for the officer to recall the audio clip. The SMS shall replay the audio file without preventing or degrading any data logging function or live audio clips from being recorded.
 - d. Provide hard disk space on the SMS sufficient to record telephone quality (16 bit, 8 kHz minimum) for 500 channel-hours of audio online. Provide one recording channel per audio talk path.
 - e. Provide audio playback ability to all remote PCs running SMS client software.
 3. Automatic Notification
 - a. The SMS client software shall have the ability to allow facility administrators to setup rules based on control station or PLC system events that will automatically send email or text message when the conditions specified by a rule are true.
 - b. The SMS shall allow the facility administrators to configure at least 10 rules to automatically generate an email or print notification for any of the following conditions:
 - 1) When an event occurs.
 - 2) Each rule shall allow the facility administrator to specify the time of day that the rule is active.
 - c. The SMS shall allow the facility administrators to specify multiple email recipients for each notification rule and establish distribution lists that can be used for any notification.
 - d. The SMS shall pass all emails through the Secure Gateway to the designated email server using Simple Mail Transfer Protocol (SMTP).
 4. Archiving and System Management
 - a. The database shall be able to contain up to 5 million transactions prior to the need to archive data.
 - b. Automatic archives shall be user configurable for frequencies of daily, weekly, monthly, quarterly, semi-annual, or yearly. In addition, the user shall be able to select the day of the week or month to create the archives.

- c. When performing an archive, the user shall be able to select to archive only, archive and delete the archived events from the database, or delete only. The user shall also have the option to perform the same action on audio files.
- d. Archived events shall be viewable in an identical format as the original SMS, using the standard SMS application. The sorting, searching, and reporting generating functionality shall be identical to the standard SMS application as well.
- e. The system shall notify the user when the transaction register reaches a user definable limit to allow for data archiving. If the database reaches the user-defined limit, an automatic archive will be performed so that current logging will not be affected.
- f. The user shall have the ability to perform a full database backup.

1.04 SYSTEM FEATURES

- A. The SMS performs several valuable functions, but is not an essential component of any operational control system. It shall be configured as follows:
 - 1. The SMS shall be connected via Ethernet to the PLC(s).
 - 2. The SMS shall receive and record alarms and transactions from the PLC within 500 milliseconds of the occurrence. The SMS shall record Time/Date, Device Type, Device Name, Event Name/Description, and the name of the control station and operator for control station initiated actions.
- B. Transactions and Alarms shall include, but are not limited to:
 - 1. The SMS shall record to disk all door activities, including unlock requests, door position changes, violations, violation silencing, and violation resetting.
 - 2. All interlock override activities.
 - 3. The SMS records all intercom call activity, including when the call was placed or audio threshold alarm occurred, when the station was connected to, and when the call was disconnected.
 - 4. Every intercom pushbutton press.
 - 5. All Access system activities.
 - 6. All Misc. system activities.
 - 7. All CCTV system activities.
 - 8. All Auxiliary control activities.
 - 9. All PLC system faults.
 - 10. All control station login/logout activities.
 - 11. All fire alarm activities by zone.
 - 12. All control station Occurrence Log transactions.
 - 13. All SMS automatic notification events.
- C. The SMS will provide preventative maintenance and enhanced analysis functions.
- D. The SMS provides the following features:
 - 1. If multiple control stations and/or PLCs are provided, the SMS shall be capable of recording all events of all stations and PLCs.
 - 2. Transactions sent to screen, disk or printer are time and date stamped.
 - 3. Provide password protection to prevent modifications to the database system.
 - 4. The database reports shall include the option to export the data to an XML file to be used by owner provided software.
- E. The SMS will include a complete comprehensive relational database report utility. All reports are titled and time and date stamped. It shall be possible to easily select reports to show the history of any de vice or group of devices between specified times and dates.
- F. The user shall have the ability to easily display all of the events or to file the events based on the device type (ex: doors or cameras) or based on a specific device (ex: 'Front Door').
- G. The user shall have the ability to perform an advanced search which allows the operator to select any and all transaction types, alarms, time changes and any other system functions as described in the specifications, and is done by defining a start date and time and a stop date and time. The

computer will search any applicable matching occurrences and print either to the screen or printer as a report; thus allowing searching for:

1. Specific date/time ranges
2. Specific device types
3. Specific device names
4. Specific keyword
5. Any combination of the above

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. SMS Server

1. The server shall have the following minimum requirements:
 - a. Processor: Intel Xeon E5-2609v3, 1.9GHz, 15MB Cache, 6 Cores
 - b. Operating System: Windows Server 2012
 - c. Internal Memory: 32GB, DDR4, 2133 MHz
 - d. Storage: 3-500GB 6G SAS Hard Drives (1.5TB total)
 - e. Storage Type: RAID5
 - f. Network: 4 - Gigabit Ethernet Ports
 - g. Power Supply: Dual, Hot Swappable
2. The server shall have a licensed copy of the HMI software installed.
3. The server shall be administered remotely using any control station on the security network.
4. Approved Manufacturers
 - a. HP
 - b. Dell
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 GENERAL

- A. All work required herein shall comply with section 28 00 00 Security Control System.

END OF SECTION

This page intentionally left blank

**SECTION 31 31 16
TERMITE CONTROL****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2022.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- E. Manufacturer's Instructions: Indicate caution requirement.
- F. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of three (3) years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in the State in which the Project is located.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused by termites.
 - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS**2.01 CHEMICAL SOIL TREATMENT**

- A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.
- B. Manufacturers:
 - 1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.
 - 2. FMC Professional Solutions: www.fmcprosolutions.com/#sle.
 - 3. Syngenta Professional Products: www.syngentaprofessionalproducts.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

- A. Comply with requirements of U.S. EPA and applicable state and local codes.

- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. At Both Sides of Foundation Surface.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
- E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
- F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- G. Re-treat disturbed treated soil with same toxicant as original treatment.
- H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

- A. Do not permit soil grading over treated work.

END OF SECTION

**SECTION 32 31 36
SECURITY GATES AND BARRIERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Security gates and barriers.
- B. Controls and related wiring.

1.02 REFERENCE STANDARDS

- A. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2020.
- B. ASTM F2656/F2656M - Standard Test Method for Crash Testing of Vehicle Security Barriers; 2023.
- C. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of units with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of work of this section; require attendance by affected installers.
- C. Sequencing: Ensure that utility connections are completed in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Provide detailed drawings showing:
 - 1. Layout and overall dimensions of each major element of the barrier equipment, including the hydraulic power unit and operator control panels, if applicable.
 - 2. Foundation and anchoring requirements of the barrier equipment.
 - 3. Hydraulic schematic drawing showing size and number of hoses required to run between the barrier device and the hydraulic power unit.
 - 4. Electrical schematic including associated wiring, showing electrically connected components, including interface points for connection to equipment; indicate minimum conduit size and number of wires required to run between each component of the barrier equipment.
 - 5. Schematic drawings of the entire barrier system, with manufacturer supplied equipment connected and integrated.
- C. Certificate: Certify that products of this section meet or exceed specified requirements.
 - 1. Submit crash test certification on the barrier.
 - 2. Submit Certificate of Compliance that the barrier delivered complies with the crash rating, performance and requirements of this specification.
- D. Test Reports: Indicate test data and results of field tests, including the demonstration and compliance with the specified performance criteria and final position of component adjustments and set points.
- E. Manufacturer's Qualification Statement.
- F. Project Record Documents: After completion of field tests, provide updated drawings, showing exactly where equipment and controls are installed.
- G. Software: Copy of software required for operation of products specified under this section.
- H. Maintenance Materials: Furnish the following for Owner's use in project maintenance.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: Two of each kind of lubricant.
 - 3. Extra Stock Materials: Two of each kind of fuse.
 - 4. Extra Stock Materials: Two of each kind of filter.
 - 5. Extra Stock Materials: Two of each kind of hydraulic fluid.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.
- C. Provide one year manufacturer warranty for materials and workmanship.

PART 2 PRODUCTS**2.01 SECURITY GATES AND BARRIERS**

- A. Security Gates and Barriers: Factory-fabricated, -assembled, and -tested devices, including components for satisfactory operation; capable of resisting specified impact when installed in foundations indicated on drawings.
- B. Material: Hot-dipped galvanized steel with painted finish.
- C. Color: As selected from manufacturer's standard.

2.02 AUTOMATED GATES AND BARRIERS

- A. Automated Gates and Barriers - General: Having following characteristics as well as characteristics specified for each type:
 - 1. Comply with UL 325, Class I and ASTM F2200.
 - 2. Operation: Structural Cantilever Sliding.
 - 3. Weather-Proof Hydraulic Power Unit Enclosure.
 - 4. Material: Hot-dipped galvanized steel with painted finish.
 - 5. Color: As selected by Architect from manufacturer's full line of finishes..
 - 6. Position Sensor: Barrier deployed (up).
 - 7. Control Type: Touch-screen.
 - 8. Detection Systems: ____.
 - 9. Programming: Human Machine Interface Programmable Logic Controller (HMI PLC).
 - 10. Weight Limitations on Retractable Barriers: 15,000 pounds (6,804 kg).
 - 11. Speed Limitations on Retractable Barriers: 15 mph (24 kph).
 - 12. Main Operator Control Panel.
 - 13. Remote Operator Control Panel.
 - 14. Emergency Fast Operate (EFO).
 - 15. Hydraulic Oil Heater/Cooler.
 - 16. Products:
 - a. Basis of Design: TYMETAL; TYM-HYD Structural Cantilever Slide Gate System: www.tymetal.com/#sle..
 - b. Ameristar Perimeter Security, USA;TransPort Traverse II: www.ameristarperimeter.com/#sle..
 - c. Delta Scientific Corporation;Sliding Gate TT280: www.deltascientific.com/#sle..
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 NON-AUTOMATED BARRIERS

- A. Fixed Bollards: Permanently installed tubular steel bollards.
 - 1. Crash Test Rating: M30, based on ASTM F2656/F2656M.
 - 2. Post Design: Round, diameter 4.5 inches (114.3 mm).
 - 3. Mounting: Recessed; installed into a foundation.
 - 4. Height: 36 inches (914.4 mm).

5. Finish: Hot Dipped Galvanized w/ Paint Finish as selected by Architect from manufacturer's full line of finishes.
6. Reflective Banding.
7. Products:
 - a. **Basis of Design:** Ameristar Perimeter Security, USA; Defender Bollard:
www.ameristarperimeter.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 1. Verify location of existing utilities, grades and conditions of substrate.
 2. Verify existing vehicle detector loops, including their size, geometry and wiring.
 3. Verify integration requirements with other site security equipment including but not limited to card readers, tire puncture devices, gates and other automated barrier systems.

3.02 PREPARATION

- A. Protect existing work from damage due to installation of this work.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide manufacturer's certified, field supervisor during key milestones of the installation of the barrier.

3.05 SYSTEM STARTUP

- A. Prepare and start equipment in accordance with manufacturers' instructions and recommendations.
- B. Adjust for proper operation within manufacturer's published tolerances.

3.06 CLEANING

- A. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.07 COMMISSIONING

- A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.
- B. Test electrical grounding for compliance with requirements of authorities having jurisdiction.
- C. Perform the following Functional Tests and record results in a Test Report:
 1. Raise and lower the barrier device, through their complete range of operation, monitoring the time required for each cycle.
 2. Cycle each barrier using the specified duty cycle for not less than 30 minutes, to test for heat buildup in the hydraulic system.
 3. Perform no less than 10 operations of the Emergency Fast Operate (EFO) function.
 4. Use of operator control panel functions and indicators.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.09 PROTECTION

- A. Protect installed units from subsequent construction operations.

3.10 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

This page intentionally left blank

**SECTION 32 35 00
SCREENING DEVICES****PART 1 GENERAL****1.01 RELATED REQUIREMENTS**

- A. Section 04 20 00 - Unit Masonry.

1.02 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.
- D. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

1.04 QUALITY ASSURANCE**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Metal Screening Devices:
 - 1. Posts: Aluminum, extruded in accordance with ASTM B221.
 - 2. Panels: Aluminum, in accordance with ASTM B209/B209M.
 - a. Pattern: Solid.
 - b. Size: 48 by 78 inches (122 by 189 cm).
 - c. Color: As indicated on drawings.
 - d. Finish: Smooth.
- B. Masonry Screening Devices:
 - 1. Common Brick: ASTM C62, Grade SW; solid units.
 - a. Nominal size: As indicated on drawings.
 - 2. Mortar: ASTM C91/C91M, Type N.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Metal Screening Devices:
 - 1. Install according to manufacturer's written instructions.
 - 2. Post Framing:
 - a. Anchor posts to concrete pad according to manufacturer's recommendations
 - b. Set posts level and plumb in position indicated on drawings.
 - c. Make provisions for erection loads and sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
 - 3. Panel Sheathing:
 - a. Securely fasten to posts.
- B. Masonry Screening Devices:
 - 1. See Section 04 20 00.
 - 2. Common Brick:
 - a. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
 - b. Lay hollow masonry units with face shell bedding on head and bed joints.

- c. Do not butter corners of joints or excessive furrowing of mortar joints.
- d. Remove excess mortar and mortar smears as work progresses.
- e. Remove excess mortar with water-repellent admixture promptly. Do not use acids, sandblasting, or high-pressure cleaning methods.
- f. Interlock intersections and external corners, except for units laid in stack bond.
- g. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment are made, remove mortar and replace.
- h. Perform jobsite cutting of masonry units with proper tools to provide straight, clean, and unchipped edges. Prevent broken masonry unit corners or edges.

3.02 TOLERANCES

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.04 PROTECTION

- A. Protect installed screening device from subsequent construction operations.
- B. Touch up, repair, or replace damaged products.

END OF SECTION