

SPECIFICATIONS  
FOR  
City of Pell City  
**FIRE STATION NO.2**

**BID & CONSTRUCTION DOCUMENTS**

2911 Martin Street South  
Cropwell, Alabama 35054

Architect's Project Number: 1917

DATE: 10-31-2024



A handwritten signature in black ink, appearing to read "Blakeney S. Nelson".

PREPARED BY:

CMH Architects, Inc.  
1800 International Park Drive, Suite 300  
Birmingham AL 35243  
(205) 969-2696

**SECTION 00 0102  
PROJECT INFORMATION**

**PART 1 GENERAL****1.01 PROJECT IDENTIFICATION**

- A. Project Name: City of Pell City Fire Station No. 2, located at: 2911 Martin Street South, Cropwell, Alabama 35054.
- B. Architect's Project Number: 1917 .
- C. The Owner, hereinafter referred to as Owner: City of Pell City.
  - 1. Sales Tax Exemption Number: TBD.

**1.02 PROJECT DESCRIPTION**

- A. Summary Project Description: \_\_\_\_\_.
- B. Contract Scope: Construction.
- C. Contract Terms: Lump sum (fixed price, stipulated sum).

**1.03 PROJECT CONSULTANTS**

- A. Owner's Traffic Consultant: Skipper Consulting, Inc..
  - Address: 3644 Vann Road, Suite 100.
  - City, State, Zip: Birmingham AL 35235.
  - Contact: Darrell Skipper
  - Phone: (205) 655-8855.
  - E-mail: darrell@skipperinc.com.
- B. The Architect, hereinafter referred to as Architect: CMH Architects, Inc.
  - Address: 1800 International Park Drive, Suite 300.
  - City, State, Zip: Birmingham AL 35243.
  - Contact: Blake Nelson
  - Phone: (205) 969-2696.
  - E-mail: bnelson@CMHArch.com.
- C. The Owner's Geotechnical Consultant, hereinafter referred to as Geotechnical Consultant: Terracon.
  - Address: 2147 Riverchase Office Road.
  - City, State, Zip: Hoover AL 35244.
  - Contact: Sam Wheeler
  - Phone: (205) 942-1289.
  - E-mail: Sam.Wheeler@terracon.com.
- D. The Civil Engineer, hereinafter referred to as Civil Engineer: Insite Engineering, LLC.
  - Address: 5800 Feldspar Way.
  - City, State, Zip: Hoover AL 35244.
  - Contact: John Jett
  - Phone: (205) 733-9696.
  - E-mail: jjett@insiteengineering.org.
- E. The Structural Engineer, hereinafter referred to as Structural Engineer: MBA Engineers, Inc..
  - Address: 300 20th Street North.
  - City, State, Zip: Birmingham AL 35203.
  - Contact: Andrew Marlin
  - Phone: (205) 323-6385.
  - E-mail: amarlin@mbasei.com.

- F. The Fire Protection Engineer, hereinafter referred to as Fire Protection Engineer: MW/Davis Dumas & Associates, Inc..  
Address: 4500 Southlake Park.  
City, State, Zip: Hoover AL 35244.  
Contact: Dean Belk  
Phone: (205) 252-0246.  
E-mail: dbelk@mwdda.com.
- G. The Plumbing Engineer, hereinafter referred to as Plumbing Engineer: MW/Davis Dumas & Associates, Inc. .  
Address: 4500 Southlake Park.  
City, State, Zip: Hoover AL 35244.  
Contact: Bob Hommerson  
Phone: (205) 252-0246.  
E-mail: bhommerson@mwdda.com.
- H. The Mechanical Engineer, hereinafter referred to as Mechanical Engineer: MW/Davis Dumas & Associates, Inc..  
Address: 4500 Southlake Park.  
City, State, Zip: Hoover AL 35244.  
Contact: Sammy Davis  
Phone: (205) 252-0246.  
E-mail: sdavis@mwdda.com.
- I. The Electrical Engineer, hereinafter referred to as Electrical Engineer: Professional Engineering Group.  
Address: 7145 Happy Hollow Road #200.  
City, State, Zip: Trussville AL 35173.  
Contact: Greg Mims  
Phone: (205) 655-4237.  
E-mail: gmims@proenggroup.com.
- J. The Landscape Architect, hereinafter referred to as Landscape Architect: Plot Studio  
  
Address: 204 Main St., Suite 125  
City, State, Zip: Trussville, AL 35173  
Contact: Matt Phillips  
Phone: (205) 538-2087  
E-mail: matt@plotstudiola.com

#### **1.04 PROCUREMENT TIMETABLE**

- A. Refer to Advertisement to Bid, Instructions to Bidders and Supplemental Instructions to Bidders for information concerning procurement.
- B. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

#### **1.05 PROCUREMENT DOCUMENTS**

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
1. From Owner at the Architect's address listed above.

#### **1.06 BID SECURITY**

- A. Bids shall be accompanied by a security deposit as follows:
1. Bid Bond on AIA A310 Bid Bond Form.
  2. Certified check in the amount of 5 % of Bid, not to exceed \$\_\_\_\_\_.
  3. Refer to the Instructions to Bidders and the Supplemental Instructions to Bidders for required Bid Bond.

#### **PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

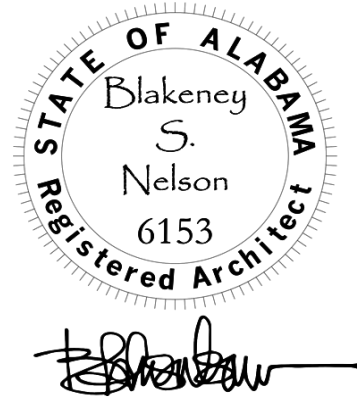


**SECTION 00 0107.10  
SEAL PAGE - ARCHITECT**

**DESIGN PROFESSIONAL OF RECORD  
ARCHITECT**

**CMH ARCHITECTS, INC.**

**NAME ON THE PROFESSIONAL SEAL: Blakeney S. Nelson**



**PROCUREMENT AND CONTRACTING REQUIREMENTS**

**DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

- 00 0101 - Project Title Page
- 00 0102 - Project Information
- 00 0107.10 - Seal Page - Architect
- 00 0110 - Table of Contents
- 00 0115 - List of Drawing Sheets
- 00 1113 - Advertisement for Bids
- 00 2113 - Instructions to Bidders
- 00 2114 - Supplementary Instructions to Bidders
- 00 4100 - Bid Form for Lump Sum Contracts
- 00 4321 - Attachment 'A' to Bid Form - Accounting of Sales Tax
- 00 4325 - Substitution Request Form - During Bidding/Negotiation
- 00 4326 - Request For Information – During Bidding/Negotiation
- 00 5000 - Contracting Forms and Supplements
- 00 5038 - Partial Release of Lien
- 00 5039 - Waiver of Lien
- 00 6325 - Substitution Request Form - During Construction
- 00 6326 - Request For Information – During Construction
- 00 6328 - Architect's Supplemental Instructions
- 00 6330 - Construction Change Directive
- 00 6332 - Request For Proposal
- 00 6340 - Electronic File Transfer Agreement
- 00 7300 - Supplementary Conditions AIA 201-2017

**SPECIFICATIONS****DIVISION 01 -- GENERAL REQUIREMENTS**

- 01 1000 - Summary
- 01 2000 - Price and Payment Procedures
- 01 2300 - Alternates
- 01 2500 - Substitution Procedures
- 01 3000 - Administrative Requirements
- 01 3216 - Construction Progress Schedule
- 01 4000 - Quality Requirements
- 01 5000 - Temporary Facilities and Controls
- 01 7000 - Execution and Closeout Requirements
- 01 7419 - Construction Waste Management and Disposal
- 01 7800 - Closeout Submittals
- 01 7810 - Project Record Documents

**DIVISION 03 -- CONCRETE**

- 03 3511 - Concrete Floor Finishes
- 03 3533 - Stamped Concrete Finishing
- 03 3650 - Polished Concrete Floor System

**DIVISION 04 -- MASONRY**

- 04 2000 - Unit Masonry
- 04 4313 - Stone Masonry Veneer
- 04 7200 - Cast Stone Masonry

**DIVISION 05 -- METALS**

- 05 4000 - Cold-Formed Metal Framing
- 05 5000 - Metal Fabrications
- 05 5133 - Metal Ladders
- 05 5213 - Pipe and Tube Railings

**DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES**

- 06 1000 - Rough Carpentry
- 06 4100 - Architectural Casework

**DIVISION 07 -- THERMAL AND MOISTURE PROTECTION**

- 07 2100 - Thermal Insulation
- 07 2113.13 - Foam Board Insulation
- 07 2140 - Foamed-in-Place Masonry Wall Insulation
- 07 2627 - Air and Water-Resistive Barrier Specification
- 07 4113 - Metal Roof Panels - Petersen Aluminum
- 07 6200 - Sheet Metal Flashing and Trim
- 07 8400 - Firestopping

**DIVISION 08 -- OPENINGS**

- 08 1113 - Hollow Metal Doors and Frames
- 08 3301 - Insulated Rolling Service Doors
- 08 3500 - Electric Four Fold Doors
- 08 3600 - Insulated Sectional Overhead Doors
- 08 4313 - Aluminum-Framed Storefronts
- 08 5213 - Aluminum Clad Double Hung Wood Windows
- 08 7100 - Door Hardware
- 08 7123 - Commercial Door Operators
- 08 9100 - Louvers

**DIVISION 09 -- FINISHES**

- 09 2116 - Gypsum Board Assemblies
- 09 3000 - Tiling
- 09 5100 - Acoustical Ceilings
- 09 6500 - Resilient Flooring
- 09 6513.13 - Resilient Base
- 09 9000 - Painting and Coating

**DIVISION 10 -- SPECIALTIES**

- 10 1400 - Signage
- 10 2600 - Corner Guards
- 10 4400 - Fire Protection Specialties
- 10 7300 - Aluminum Canopies - Design/Build
- 10 7500 - Flagpoles

**DIVISION 12 -- FURNISHINGS**

- 12 2400 - Window Shades - MechoShade Systems
- 12 3600 - Countertops

**END OF SECTION**

**SECTION 00 0107.11  
SEAL PAGE - CIVIL ENGINEER**

**DESIGN PROFESSIONAL OF RECORD**

**CIVIL ENGINEER INSITE ENGINEERING LLC.**

**NAME ON PROFESSIONAL SEAL: John L. Jett**



**DIVISION 01 -- GENERAL REQUIREMENTS**

01 7320 - Selective Demolition

**DIVISION 31 -- EARTHWORK**

31 1000 - Site Clearing

31 2000 - Earth Moving

31 3116 - Termite Control

**DIVISION 32 -- EXTERIOR IMPROVEMENTS**

32 1216 - Asphalt Paving

32 1313 - Concrete Paving

**DIVISION 33 -- UTILITIES**

33 0500 - Common Work Results for Utilities

33 3000 - Sanitary Sewerage

33 4100 - Storm Utility Drainage Piping

**END OF SECTION**

**SECTION 00 0107.13  
SEAL PAGE - STRUCTURAL**

**DESIGN PROFESSIONAL OF RECORD  
STRUCTURAL ENGINEER**

**MBA ENGINEERS, INC.**

**NAME ON PROFESSIONAL SEAL: ANDREW T. MARLIN**

**DIVISION 01 -- GENERAL REQUIREMENTS**

01 4100 - Structural Tests and Special Inspections

01 4100a - Statement of Special Inspections

01 4100b - Special Inspection Schedule

01 4100c - Final Report of Special Inspections

**DIVISION 03 -- CONCRETE**

03 3000 - Cast-in-Place Concrete

**DIVISION 05 -- METALS**

05 1200 - Structural Steel Framing

05 3100 - Steel Decking

05 4400 - Cold-Formed Metal Trusses



**END OF SECTION**

**SECTION 00 0107.14  
SEALS PAGE - FIRE PROTECTION**

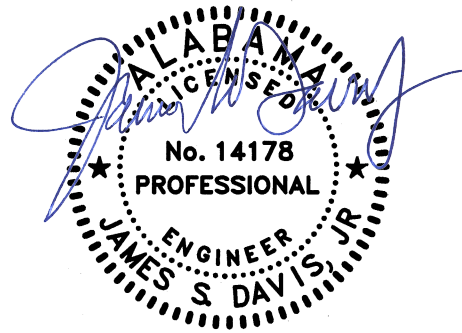
**DESIGN PROFESSIONAL OF RECORD  
FIRE PROTECTION ENGINEER  
MW / DAVIS DUMAS & ASSOCIATES, INC.  
James Sam Davis, Jr., PE  
President**

**LISTING OF APPLICABLE SPECIFICATION SECTIONS**

**DIVISION 21 – FIRE SUPPRESSION**

21 0500 GENERAL PROVISIONS – FIRE SUPPRESSION  
21 1000 MATERIALS AND METHODS – FIRE SUPPRESSION  
21 4000 FIRE SUPPRESSION

**END OF SECTION**



10-25-2024

**SECTION 00 0107.15  
SEALS PAGE - PLUMBING**

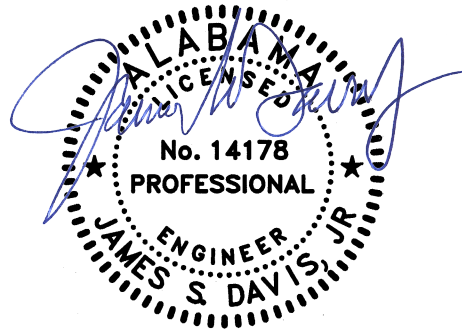
**DESIGN PROFESSIONAL OF RECORD  
PLUMBING ENGINEER  
MW / DAVIS DUMAS & ASSOCIATES, INC.  
James Sam Davis, Jr., PE  
President**

**LISTING OF APPLICABLE SPECIFICATION SECTIONS**

**DIVISION 22 - PLUMBING**

22 0500	GENERAL PROVISIONS – PLUMBING
22 1000	MATERIALS & METHODS – PLUMBING
22 1500	THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS
22 2000	PLUMBING FIXTURES AND EQUIPMENT

**END OF SECTION**



10/25/2024

**SECTION 00 0107.16  
SEALS PAGE - MECHANICAL**

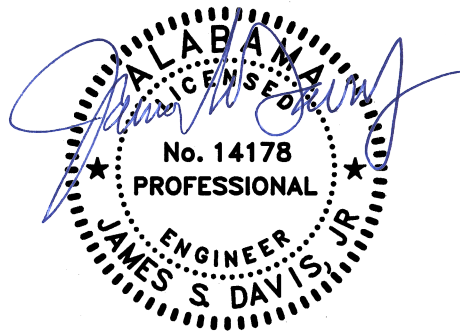
**DESIGN PROFESSIONAL OF RECORD  
MECHANICAL ENGINEER  
MW / DAVIS DUMAS & ASSOCIATES, INC.  
James Sam Davis, Jr., PE  
President**

**LISTING OF APPLICABLE SPECIFICATION SECTIONS**

**DIVISIN 23 - HVAC**

23 0500	GENERAL PROVISIONS – HVAC
23 1000	MATERIALS AND METHODS – HVAC
23 1500	THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS
23 5000	HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES
23 6000	AIR DISTRIBUTION
23 7000	HVAC TESTING AND BALANCING
23 8000	CONVENTIONAL AUTOMATIC CONTROLS

**END OF SECTION**



10/25/2024



SECTION 00 0107.17  
SEALS PAGE - ELECTRICAL

DESIGN PROFESSIONAL OF RECORD

ELECTRICAL ENGINEER

PROFESSIONAL ENGINEERING GROUP, INC.

NAME ON PROFESSIONAL SEAL: RONNY LYNN HEAD

LIST OF APPLICABLE SPECIFICATION SECTIONS

**Division 26 - ELECTRICAL**

- 26 0100 – ELECTRICAL GENERAL
- 26 0121 – ELECTRICAL SUBMITTALS
- 26 0127 – TEMPORARY ELECTRICAL FACILITIES
- 26 0128 – FIRESTOPPING
- 26 0129 - TEMPORARY FIRESTOPPING
- 26 0519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0533 – RACEWAYS FOR ELECTRICAL SYSTEMS
- 26 0534 – OUTLET BOXES, JUNCTION BOXES, WIRING BODIES, AND WIRING GUTTERS
- 26 0535 – SWITCHES AND RECEPTACLES
- 26 0543.16 – EXCAVATING FOR ELECTRICAL
- 26 0553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 26 0820 – TESTING OF ELECTRICAL SYSTEMS
- 26 2100 – ELECTRICAL SERVICE ENTRANCE
- 26 2416 – PANELBOARDS
- 26 2800 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS
- 26 3213.19 – NATURAL GAS ENGINE DRIVEN GENERATOR SETS
- 26 3623.16 – AUTOMATIC TRANSFER SWITCH DELAYED TRANSITION
- 26 5000 – LIGHTING

**Division 27 - COMMUNICATIONS**

- 27 2100 – DATA COMMUNICATIONS NETWORK EQUIPMENT

**Division 28 – ELECTRONIC SAFETY AND SECURITY**

- 28 4621.11 – ADDRESSABLE FIRE ALARM SYSTEM

END OF SECTION



**SECTION 00 0110  
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00 4322 - Application for Sales Use Tax Certificate of Exemption		
00 4323 - e-Verify Memorandum of Understanding		
00 4325 - Substitution Request Form - During Bidding/Negotiation		
00 4326 - Request For Information – During Bidding/Negotiation		
00 5000 - Contracting Forms and Supplements		
00 5038 - Partial Release of Lien		
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00 7300 - Supplementary Conditions AIA 201-2017		

<b>Section Title</b>	<b>Date of Original Issue</b>	<b>Date of Current Revision</b>
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01 3216 - Construction Progress Schedule		
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01 4100a - Statement of Special Inspections		
01 4100b - Special Inspection Schedule		
01 4100c - Final Report of Special Inspections		
01 5000 - Temporary Facilities and Controls		
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01 7419 - Construction Waste Management and Disposal		
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02 3132 - Geotechnical Field Observation Report		
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03 3511 - Concrete Floor Finishes		
03 3533 - Stamped Concrete Finishing		
03 3650 - Polished Concrete Floor System		
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04 2000 - Unit Masonry		
04 4313 - Stone Masonry Veneer		
04 7200 - Cast Stone Masonry		

<b>SECTION TITLE</b>	<b>DATE OF ORIGINAL ISSUE</b>	<b>DATE OF CURRENT REVISION</b>
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05 3100 - Steel Decking		
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05 5133 - Metal Ladders		
05 5213 - Pipe and Tube Railings		
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06 1000 - Rough Carpentry		
06 4100 - Architectural Casework		
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07 2113.13 - Foam Board Insulation		
07 2140 - Foamed-in-Place Masonry Wall Insulation		
07 2627 - Air and Water-Resistive Barrier Specification		
07 4113 - Metal Roof Panels - Petersen Aluminum		
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07 8400 - Firestopping		
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08 1113 - Hollow Metal Doors and Frames		
08 3323 - Overhead Coiling Doors		
08 3500 - Electric Four Fold Doors		
08 3600 - Insulated Sectional Overhead Doors		
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08 5213 - Aluminum Clad Double Hung Wood Windows		
08 7100 - Door Hardware		
08 7123 - Commercial Door Operators		
08 9100 - Louvers		
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09 2116 - Gypsum Board Assemblies		
09 3000 - Tiling		
09 5100 - Acoustical Ceilings		
09 6500 - Resilient Flooring		
09 6513.13 - Resilient Base		
09 9000 - Painting and Coating		

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10 2600 - Corner Guards		
10 4400 - Fire Protection Specialties		
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10 7500 - Flagpoles		
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23 7000 - HVAC Testing and Balancing		
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104	M1.03	ROOF PLAN – MECHANICAL PLAN
105	M2.01	MECHANICAL DETAILS
106	M2.02	MECHANICAL DETAILS
107	M2.03	MECHANICAL DETAILS
108	M2.04	MECHANICAL CONTROLS
109	M2.05	VRF SCHEMATIC
110	M2.06	VRF SCHEMATIC

## PLUMBING

111	P0.01	PLUMBING SCHEDULES, DETAILS, NOTES & LEGENDS
112	P0.02	PLUMBING RISERS
113	P1.01	FLOOR PLAN – NONPRESSURE PLUMBING
114	P1.02	FLOOR PLAN – PRESSURE PLUMBING

## **ELECTRICAL**

115	E0.01	ELECTRICAL LEGEND & NOTES
116	E1.00	SITE ELECTRICAL
117	E1.01	ELECTRICAL – LIGHTING
118	E2.01	ELECTRICAL – POWER
119	E3.01	ELECTRICAL – FIRE ALARM
120	E5.01	ELECTRICAL – LEGENDS & NOTES
121	E6.01	ELECTRICAL – DETAILS

## **FIRE PROTECTION**

122	FP0.1	DETAILS & NOTES – FIRE PROTECTION
123	FP1.01	FLOOR PLAN – FIRE PROTECTION

**SECTION 00 1113  
ADVERTISEMENT FOR BIDS -**

**ADVERTISEMENT FOR BID  
PELL CITY FIRE STATION #2  
CROPWELL, ALABAMA**

**SCOPE OF WORK:**

The Project consists of the construction of a new 16,665 SF Fire Station #2 for the City of Pell City, Alabama, located at 2911 Martin Street South, Cropwell, AL 35054, including all associated site work. The double-depth, rear-entry/front-exit 4-bay station will be constructed of loadbearing CMU walls with stone and brick masonry veneer, cold-formed metal roof trusses, and a standing seam metal roof. It will include eight (8) bunkrooms, a hardened storm shelter area, and other residential and operational spaces necessary for daily operation of a flagship facility with three (3) shifts. The site plan includes a covered outdoor patio, separate public and staff parking areas, onsite stormwater detention, and a new emergency-use traffic signal on Highway 231 (Martin St. S.).

A mandatory Pre-bid Conference will be held on Thursday, December 5, 2024, at 10:00 am CST at Pell City, AL, City Hall Chambers. Due to the nature of this project, General Contractors wishing to submit a bid must attend the Pre-bid Conference. If the number of bidders who attend the Pre-bid Conference decreases to where there is little or no competition, others may be allowed to bid, or the bid may be postponed at the discretion of the Owner.

Sealed bids from the General Contractors for the Pell City Fire Station #2 project will be received by City of Pell City at Pell City, AL, Council Chambers, until 2:00 pm CST Tuesday, December 17, 2024, at which time and place they will be publicly opened and read.

No Bids will be accepted after 2:00 pm CST Tuesday, December 17, 2024, this requirement will not be waived. The official time will be determined by the Architect, or his designated representative. The proposals will be opened at this time at the location listed above.

A cashier's check or Bid Bond payable to the City of Pell City in an amount of not less than five (5) percent of the amount of the proposal, but in no event more than \$10,000 must accompany the bid. Performance and Statutory Labor and Material Payment Bonds in the amount of 100% of the Contract Price will be required at the signing of the Contract.

All bidders must submit three (3) copies of their bids on proposal forms furnished by the Architect or copies thereof. All bidder bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the provisions of Title 34, Chapter 8, Code of Alabama 1975 and must show evidence of license before bidding or the bid will not be received or considered by the Architect; the bidder shall show such evidence by clearly displaying his or her current license number on the outside of the sealed envelope in which the proposal is delivered. The successful bidder must provide evidence of enrollment in the E-verify program per The Alabama Immigration Law (also referred to as "Act 2011-535" and codified in state law as Title 31, Chapter 13 of the Code of Alabama 1975) and amended by Act No. 2012-491 (2012) before awarding of contract. The Owner reserves the right to reject any or all the proposals and waive technical errors if, in the Owner's judgement, the best interest of the Owner will thereby be promoted.

Drawings and Project Manual will be open to public inspection beginning on November 20, 2024, at the Pell City City Hall, the office of the CMH Architects, Inc., Dodge Data and Analytics digital plan room, ConstructConnect digital plan room. Bidders must call the Owner's and/or the Architect's office at least 24 hours in advance to arrange a time to review the documents. These documents cannot be removed from the Owner's or Architect's office nor will any copies of these documents be provided to the bidders.

Bid Documents must be obtained from the Architect upon a deposit of \$250.00. Said deposit is refundable for unsuccessful bidders if all plans and specs are returned to the Architect in good condition and within ten days of the bid date. Following purchase of the initial set, additional sets for contractors and sets for subcontractors and dealers may be obtained from Alabama Graphics, 2801 5th Ave. S., Birmingham, AL 35233, (205) 252-8505 for the cost of printing and handling.

The project is being bid EXCLUDING TAXES and requires the Contractor to comply with the requirements of Act 2013-205 which was signed into law May 19, 2013. The Contractor and Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle the administration of the certificates. The contractor shall account for the tax savings on the Accounting of Sales Tax form included in the specifications behind the proposal form. Failure for the Contractor to complete this form and include with their proposal shall render the bid non-responsive.

The General Contractor awarded the project shall be responsible for paying the applicable water capital recovery and sewer impact fees to the City utility and for obtaining all necessary permits (with permit fees themselves covered by the City).

Performance Time: The project is a single-phase project and is to be complete within **365** calendar days from the Notice to Proceed. Liquidated damages apply to this project per the Supplementary Conditions.

**AWARDING AUTHORITY:**

City of Pell City  
1905 1st Avenue North  
Pell City, AL 35125

**ARCHITECT:**

CMH Architects, Inc.  
1800 International park Drive, Suite 300  
Birmingham, Al 35243

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Confirm Advertisement: 11/17/24, 11/24/24 & 12/8/2024  
St. Clair News Aegis  
Gadsden Times  
Anniston Star  
Montgomery Advertiser

**END OF SECTION**

**SECTION 00 2113  
INSTRUCTIONS TO BIDDERS**

**SUMMARY**

**1.01 SEE AIA A701, INSTRUCTIONS TO BIDDERS AVAILABLE AT BIRMINGHAM CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS, 109 RICHARD ARRINGTON JR. BOULEVARD, BIRMINGHAM, AL 35233 OR FROM THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE, NW, WASHINGTON D.C. 20006..**

**1.02 RELATED DOCUMENTS**

- A. Document 01 1000 - Summary.
- B. Document 00 1113 - Advertisement for Bids.
- C. Document 00 4100 - Bid Form.
- D. Document 00 4336 - Proposed Subcontractors Form.
- E. Document 00 4373 - Proposed Schedule of Values Form.
- F. Document 00 7300 - Supplementary Conditions:

**BID SUBMISSION**

**2.01 BIDS SIGNED AND UNDER SEAL, EXECUTED, AND DATED WILL BE RECEIVED AT THE PELL CITY CITY HALL COUNCIL CHAMBERS UNTIL 2:00 P.M. LOCAL STANDARD TIME ON DECEMBER 17, 2024.**

**2.02 NO BIDS WILL BE RECIEVED AFTER 2:00PM ON TUESDAY, DECEMBER 17, 2024.**

**2.03 BIDS WILL BE OPENED PUBLICLY IMMEDIATELY AFTER THE TIME FOR RECEIPT OF BIDS.**

**2.04 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS**

- A. Work of this proposed Contract comprises building construction, including general construction and Site Work.
- B. Project Location:  
2911 Martin Street South (Highway 231).  
Cropwell, Alabama35054.

**2.05 CONTRACT TIME**

- A. Perform the Work in 365 calendar days.

**BID DOCUMENTS AND CONTRACT DOCUMENTS****3.01 AVAILABILITY**

- A. Bid Documents will be available for inspection On November 20, 2024, at the Pell City City Hall, Office of the Architect, Dodge Data and Analytics digital plan room, and ConstructConnect digital plan room. Bidders must call the Owner's and/or the Architect's office at least 24 hours in advance to arrange a time to review the documents. These documents cannot be removed from the Owner's or Architect's office nor will any copies of these documents be provided to the bidders.
- B. Two sets of Bid Documents can be obtained by General Contract bidders upon receipt of a refundable deposit, by cash, in the amount of \$ 250.00 pere set.
- C. Deposit will be refunded if Bid Documents are returned complete, undamaged, unmarked and reusable, within 7 days of bid submission. Failure to comply will result in forfeiture of deposit.

**3.02 INQUIRIES/ADDENDA**

- A. Direct questions to CMH Architects, Inc., email; bnelson@cmharch.com.
- B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.

- D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

### **3.03 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS**

- A. General Requirements for Substitution Requests:
  - 1. Project Manual establishes standards for products, assemblies, and systems.
  - 2. Submit requests only for elements for which substitution is specifically allowed in the Project Manual.
  - 3. Provide sufficient information to determine acceptability of proposed substitutions.
  - 4. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- B. Substitution Request Time Restrictions:
  - 1. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.
- C. Substitution Request Form:
  - 1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- D. Review and Acceptance of Request:
  - 1. Architect may approve the proposed substitution and will issue an Addendum to known bidders.

## **SITE ASSESSMENT**

### **4.01 SITE EXAMINATION**

- A. Examine the project site before submitting a bid.

### **4.02 MANDATORY PRE-BID CONFERENCE**

- A. A Mandatory Pre-Bids conference has been scheduled for 10:00 a.m. CST on Thursday, December 5, 2024, at the Pell City City Hall.
- B. All General Contractor bidders are required to attend.
- C. Representatives of Architect will be in attendance.
- D. Summarized minutes of this meeting will be circulated to attendees. These minutes will not form part of Contract Documents.
- E. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

## **BID SUBMISSION**

### **5.01 SUBMISSION PROCEDURE**

- A. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

### **5.02 BID INELIGIBILITY**

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.
- C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, invalidate the bid.

## **BID ENCLOSURES/REQUIREMENTS**

**6.01 SECURITY DEPOSIT**

- A. Bids shall be accompanied by a security deposit as follows:
  - 1. Bid Bond in the amount of 5 % of the Bid on AIA A310 Bid Bond Form.
  - 2. Certified check in the amount of \$10,000.00 made payable to the Owner.
- B. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
- C. Include the cost of bid security in the Bid Amount.
- D. If no contract is awarded, all security deposits will be returned.

**6.02 PERFORMANCE ASSURANCE**

- A. Accepted Bidder: Provide a Performance bond as described in 00 7300 - Supplementary Conditions.
- B. Include the cost of performance assurance bonds in the Bid Amount.

**6.03 INSURANCE**

- A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company stating their intention to provide insurance to the bidder in accordance with the insurance requirements of Contract Documents.

**6.04 BID FORM REQUIREMENTS**

- A. Complete all requested information in the Bid Form and Appendices.
- B. Taxes: Refer to Supplementary Conditions for inclusion of taxes and products that are tax exempt.

**6.05 BID FORM SIGNATURE**

- A. The Bid Form shall be signed by the bidder, as follows:
  - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
  - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
  - 3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
  - 4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

**6.06 ADDITIONAL BID INFORMATION**

- A. The lowest bidder will be requested to complete the Supplements To Bid Forms within 24 hours after submission of bids.
- B. Submit the following Supplements 24 hours after bid submission:
  - 1. All Subcontractors include the names of all Subcontractors and the portions of the Work they will perform.
  - 2. AIA G703 Proposed Schedule of Values which identifies the Bid Amount segmented into portions.

**6.07 SELECTION AND AWARD OF ALTERNATES**

- A. Indicate variation of bid price for Alternates listed on the Bid Form. Unless otherwise indicated, indicate Alternates as a difference in bid price by adding to or deducting from the base bid price.



- B. Bids will be evaluated on the base bid price. After determination of a successful bidder, consideration will be given to Alternates and bid price adjustments.

**BID ACCEPTANCE/REJECTION**

**7.01 DURATION OF BID**

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

**7.02 ACCEPTANCE OF OFFER**

- A. Owner reserves the right to accept or reject any or all offers.
- B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

**END OF SECTION**

**SECTION 00 2114  
SUPPLEMENTARY INSTRUCTIONS TO BIDDERS**

**PART 1 GENERAL****1.01 SUMMARY**

- A. The following modifies changes, deletes from or adds to **AIA Document A701 - 2018 *Instructions to Bidders***. Where any Article of the Instructions to Bidders is modified or any Paragraph, Subparagraph or Clause is modified or deleted by these Supplementary Instructions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause remain in effect.
- B. The Supplementary Instructions to Bidders are to be read as complementary to the Instructions to Bidders and in the event of conflict; the Supplementary Instructions to Bidders governs. In the absence of other instructions, it is to be assumed a new paragraph, subparagraph, sentence, or clause is to be added to these Supplementary General Conditions.
- C. Whenever there is a reference to Contractor, General Contractor or Prime, it is understood to mean the successful Bidder, as Contractor for the Work.

**1.02 MODIFICATIONS TO AIA DOCUMENT A701 - 2018 *INSTRUCTIONS TO BIDDERS*****TABLE OF ARTICLES****ADD TO FOLLOWING NEW ARTICLE:****9 ADDITIONAL CONTRACTOR REQUIREMENTS****ARTICLE 1 – DEFINITIONS****ADD THE FOLLOWING SENTENCE TO THE END OF PARAGRAPH 1.1:**

The Bidding Documents , as listed above are included as a part of the Contract.

**ADD THE FOLLOWING SENTENCE TO THE END OF PARAGRAPH 1.2:**

The General Conditions are AIA Document A201 - 2017 General Conditions of the Contract for Construction or AIA Document A232 - 2019 General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

**ADD THE FOLLOWING NEW PARAGRAPH:**

**1.10** The Owner is City of Pell City. Where the word "Owner" is used it refers to an authorized representative of the Owner.

**ARTICLE 2 – BIDDER'S REPRESENTATIONS****DELETE PARAGRAPH 2.1 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:**

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

- .1** the Bidder has read and understands the Contract Documents, including the Bidding Requirements, to the extent they relate to the Work for which the Bid is submitted; their relationship to the other portions of the Project being bid concurrently; and their relationship to all Work previously bid and/or presently under construction;
- .2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction. Each Bidder's responsibility is not limited to the trade or contract of a particular Bidder. Each Bidder must examine the documents pertaining to the work of other contracts and other trade contractors as his responsibility for certain work may be noted therein;
- .3** the Bid complies with the Bidding Documents and the successful Bidder, as Contractor, will not be allowed any extra compensation by reason of any matter or thing that the Bidder could have informed himself of prior to submitting his Bid;

- .4 that all questions regarding the Project are to be submitted in writing via fax or email to CMH Architects, Inc., who will review. After the Architect has reviewed, he will respond if necessary with a written addendum;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception;
- .6 the Bidder has read and understands the provision for liquidated damages set forth in the form of the Agreement between the Owner and Contractor; and
- .7 the successful Bidder, as Contractor, will be appointed Purchasing Agent for the Owner for the limited purpose of purchasing equipment, material, supplies and other items necessary to complete the Work required in ARTICLE 9 of the AIA Document A101 - 2017 Standard Form of Agreement Between Owner and Contractor Where the basis of payment is a Stipulated Sum..

### **ARTICLE 3 - BIDDING DOCUMENTS**

#### **3.2 Modification or Interpretation of Bidding Documents**

##### **ADD THE FOLLOWING SUBPARAGRAPH TO 3.2.1:**

- .1 Successful Bidders, as Contractor, will not be granted any adjustments in the Contract Sum to the extent caused by any inconsistency or conflict in the drawings and specifications of which the Bidder was aware of but failed to promptly notify the Architect.

##### **ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 3.2.2:**

- .1 All requests and inquiries must be submitted to the Architect digitally by fax or email and must be received by 5:00 pm local time no later than seven days prior to the bid date.
- .2 Bidders' failure to request clarification does not relieve the successful Bidder, as Contractor, of his responsibilities to perform the work and comply with the intent of the Contract Documents as interpreted by the Architect. The execution of the Agreement between Contractor and Owner is considered an implicit indication that the Contractor has a thorough comprehension of the full intent and scope of the Contract Documents.

##### **ADD THE FOLLOWING NEW SUBPARAGRAPHS:**

**3.2.4** A Pre-bid Conference will be held on 12-05-2024 at 10:00 am local time at the Pell City, AL, Council Chambers, followed by a site visit. The purpose of the Pre-bid Conference is to review the general requirements and to discuss questions from the Bidders. Answers to questions and/or clarifications will be issued in the form of an Addendum.

#### **BECAUSE OF THE NATURE OF THE WORK REQUIRED FOR THIS PROJECT, CONTRACTORS WISHING TO BID THE PROJECT MUST ATTEND THE PRE-BID CONFERENCE.**

- .1 Bidders are strongly encouraged to visit the site and the surrounding area to determine the best methods for material delivery and staging.
- .2 If the number of Bidders who are in attendance at the Pre-Bid Conference is such that there is little or no competition, other contractors may be allowed to bid, or the Bid date may be postponed, at the sole discretion of the Owner.

#### **3.3 Substitutions**

##### **ADD THE FOLLOWING SUBPARAGRAPH TO SUBPARAGRAPH 3.3.1:**

- .1 Reference to materials or systems by name, make, or catalog number is intended to establish a standard of quality and not to limit competition; the words "or equivalent/or equal" are implied following each brand name. However, all substitutions for the named item must be approved by the Architect in a written Addendum prior to submission of Bids, except as provided in Subparagraph 3.3.8 (below).

##### **ADD THE FOLLOWING NEW SUBPARAGRAPHS:**

**3.3.6** Requests for substitution when forwarded by a Bidder to the Architect are understood to mean that the Bidder:

- .1 represents that he has personally investigated the proposed substitute product and determined that it is equivalent to or superior in all respects to that specified;
- .2 will, as Contractor, provide the same guarantee for the substitution that he would for that specified;
- .3 certifies that cost data presented is complete and includes related costs under this Work but excludes costs under separate contracts and the Architect's redesign costs; and that if successful Bidder, as Contractor, he waives all claims for additional costs related to the substitution which subsequently become apparent;
- .4 if successful Bidder, as Contractor, will bear all additional costs incurred by any party as a result of this substitution;
- .5 if successful Bidder, as Contractor, will bear all costs, through the Owner, incurred by the Architect for any additional design, engineering, coordination or inspection services required to implement the substitution; and
- .6 if successful Bidder, as Contractor, will coordinate the installation of the accepted substitute making such changes as may be required for the work to be complete in all aspects.

**3.3.7** Substitutions will not be considered if their implementation requires substantial revision of the Contract Documents in order to accommodate their use unless the Bidder agrees if successful, as Contractor, to bear the design, investigative and construction costs of such revisions.

**3.3.8** No request for substitution will be considered unless submitted under cover of letter from a qualified Bidder received at least 10 days prior to receipt of Bids. Substitution requests must be accompanied by documentation sufficiently describing the item being requested for consideration, applicable project specification section, any changes to substitution is accepted and other information as the Architect may require. Only substitutions that are issued by written Addendum will be acceptable.

- .1 All substitution requests must be received directly from a qualified Bidder. Requests received from vendors, suppliers, manufacturers, or sale representatives that are not submitted through a qualified Bidder will **not be** considered.

**3.3.9** After receipt of bids, no substitution of material, equipment or technique will be considered unless substantiated by one of the following conditions:

- .1 required for compliance with subsequent interpretation of Code requirements or insurance regulations;
- .2 impossibility of supplying in conformance with the Contract Documents, through no fault of the Contractor.
- .3 Where the substitution would clearly serve the Owner's best interests, in terms of cost, time, value or other considerations.

**3.3.10** Substitution requests made after receipt of bids must be timely, in writing, and accompanied by adequate data. Accepted changes will be incorporated into the Contract Documents by Change Order or other written order.

## **ARTICLE 4 – BIDDING PROCEDURES**

### **4.1 Preparation of Bids**

#### **ADD THE FOLLOWING TO SUBPARAGRAPH 4.1:**

Submit three (3) originals on forms identical to the forms included with the Bidding Documents.

#### **ADD THE FOLLOWING CLAUSES TO THE SUBPARAGRAPH 4.1.2:**

- .1 Bidders are to indicate "No Bid" or "N/A" in any blanks that are not used in on the bid form in order to make sure that all spaces of the bid form are filled in.

.2 Bidders are to use care when filling out their proposal forms and using response other than a dollar value. Responses of: "No Charge", "N/C", "No Change", "Not Applicable", "No Add", "N/A" or similar responses when used with Alternates will be interpreted to mean that the Alternate is a part of the project and that a bid of zero dollars is being submitted for that particular Alternate. Bidders are advised to use "\$0" instead.

**ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 4.1.4:**

.1 Any such changes to the bid form or addition of literature, qualifications, etc., other than specifically called for in the Bid Documents are not acceptable and may disqualify the Bid.

**ADD THE FOLLOWING SUBPARAGRAPH TO SUBPARAGRAPH 4.1.5:**

.1 A Bidder's response of "No Bid", "No Quote" or a blank space or other similar markings of words indicating the Bidder's refusal to submit a proposal for the Alternate will be interpreted to mean that the Bidder does not consider the Alternate part of the Project. Such a response may cause a Bid to be rejected.

**4.2 Bid Security**

**ADD THE FOLLOWING CLAUSES TO THE SUBPARAGRAPH 4.2.1:**

.1 Each bidder is required to file with his or her bid either a cashier's check drawn on an Alabama bank or a bid bond (**AIA Document A310 - 2010 Bid Bond**) executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority (City of Pell City, AL ) for an amount not less than five (5%) percent of the Awarding Authority's estimated cost or of the bid amount, but in no event more than ten thousand (\$10,000) dollars.

**ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 4.2.3**

.1 Performance and Labor and Material Payment Bonds written on **AIA Document A312 - 2010 Performance Bond**, in the amount of one hundred percent (100%) of the Contract sum, shall be delivered to the Owner with the Contract. The attorney-in-fact who executes the bond shall affix a certified and current copy of the power of attorney.

**4.3 Submission of Bids**

**ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 4.3.1:**

- .1 Bidder shall submit bid on forms identical to those provided in the bid documents.
- .2 Bids shall be submitted in a sealed opaque envelope addressed to:  
City of Pell City
- .2 Envelopes shall be marked with the Bidder's current Contractor's License Number for State of Alabama, Contractor's Address, Bid Package(s) included in the Bid, Name of Project being bid. Mailed Bids shall be inside a separate mailing envelope. Bids that do not bear the Bidder's current Contractor's license number will not be opened and will be rejected.

**1.01 ADD THE FOLLOWING SENTENCE TO SUBPARAGRAPH 4.3.3:**

No Bids will be accepted after the time stated for receipt of Bids. This requirement will not be waived. The official time will be determined by the Architect.

**4.4 Modification or Withdrawal of Bid**

**MODIFY SUBPARAGRAPH 4.4.1 AS FOLLOWS:**

A Bid may not be modified, withdrawn, or cancelled by the Bidder during the 60-day period following the time and date designated for the receipt of Bids.

**ARTICLE 5 – CONSIDERATION OF BIDS**

**5.3 Acceptance of Bid (Award)**

**DELETE SUBPARAGRAPH 5.3.2 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:**

**5.3.2** The Owner is free to accept or reject any or all of the Alternate(s) in any order, which in the Owner's judgment, is in the Owner's best interest. The numerical sequence listing the Alternates does not indicate a preference, nor does it require the Owner to accept Alternates in any particular order to determine the lowest Bidder or for any other reason.

**5.3.2.1** It is the intention of the Owner to award the project to the Contractor with the lowest Bid including any combination of alternates deemed in the best interest of the Owner and with unit prices being clearly responsive and competitive. If, in general, the Bidder with the lowest Base Bid has substantially higher prices for alternates and unit prices, the Owner reserves the right to determine the low bidder by any combination of Base Bid, alternates and unit prices it deems in its best interest to accept.

**ARTICLE 6 – POST BID INFORMATION****6.3 Submittals****DELETE SUBPARAGRAPH 6.3.1 IN ITS ENTIRETY INCLUDING SUBPARAGRAPHS AND SUBSTITUTE THE FOLLOWING:**

**6.3.1** The apparent low bidder must submit the following within twenty-four hours of receipt of bids:

- .1 a designation of the Work to be performed with Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and manufacturers and suppliers of each; and
- .3 A complete list of subcontractors, vendors, and major equipment suppliers who will be performing work for this Work, only one Subcontractor shall be listed for each category of work. All Subcontractors shall be listed. No substitution of Subcontractors will be allowed, unless approved in writing by the Owner and Architect and /or Construction Manager.
- .4 A completed Schedule of Values must be submitted by the apparent low Bidder within twenty-four hours of the receipt of Bids. The Bidder will be required to substantiate the accuracy of the completed Schedule of Values as the Architect, or Owner may require.
- .5 A complete list indicating proposed superintendent, project manager, and executive in charge assigned to the project with resumes of each for the Owner's review and approval within 24 hours of receipt.

**ARTICLE 8 – ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS****DELETE SUBPARAGRAPH 8.1.1 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:**

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

- .1 Unless otherwise required in the bidding documents, the Agreement for the Work will be written on **AIA Document AIA 101 - 2017, *Standard Form of Agreement Between Owner and Contractor***. Submit five (5) originals of the Agreement for execution and distribution to the Owner and Architect.
- .2 **AIA Document AIA132 - 2019, Exhibit A, *Insurance and Bonds*.**
- .3 **AIA Document AIA A201 - 2017, *General Conditions of the Contract for Construction*.**

**ADD THE FOLLOWING NEW ARTICLE:****ARTICLE 9 – ADDITIONAL CONTRACTOR REQUIREMENTS****9.1 Contractor as Purchasing Agent**

**9.1.1** The successful Bidder agrees that as Contractor, he will act as limited Purchasing Agent for this project according to the requirements of the Agency Agreement, so City of Pell City, Alabama can realize the tax savings as a public entity. A copy of the Agency Agreement is included in these documents.

**9.1.2** The procedure for this Agency Agreement is as defined by Legislative Act 2013-205 and as follows:.

- 1.** Comply with procedure to obtain the exemption of sales tax as outline in State of Alabama Department of Revenue Memo entitled "Tax Guidance for Contractors, Subcontractors and Alabama Governmental Entities Regarding Construction-related Contracts" (copy follows these instructions).
- 2.** The Contractor shall comply with above and submit application for exemption (form ST: EXC-01 – copy follows these instructions) for each tax-exempt project.
- 3.** Only materials that are going to be a permanent part of the building is tax exempt, i.e. no tools, ladders or sandpaper.

## **9.2 Alabama Immigration Law**

**9.2.1** The Alabama Immigration Law (also referred to as Legislative Act 2011-535 and codified in state law as Title 31, Chapter 13 of the Code of Alabama 1975 and amended by Legislative Act No. 2012-491) has the following requirements:

**9.2.2** Contractors are not required to provide an affidavit nor will they be required to obtain affidavits from their subcontractors or consultants.

**9.2.3** Contractors are required to enroll in the e-Verify program and to provide documentation of enrollment in the e-Verify program with their contracts and agreements.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 00 4100  
BID FORM FOR LUMP SUM CONTRACTS**

**Place:**Pell City, AL, Council Chambers

**Date:** December 17, 2024 at 2:00 PM local time

**CMH Project No.:**1917

**PROPOSAL OF**

\_\_\_\_\_ (HEREINAFTER CALLED  
"BIDDER") (A (STATE) \_\_\_\_\_ CORPORATION/ A  
PARTNERSHIP/ AN INDIVIDUAL - ~~STRIKE OUT INAPPLICABLE TERMS~~ DOING BUSINESS  
AS \_\_\_\_\_) TO THE CITY OF PELL CITY (\_\_\_\_\_  
HEREINAFTER CALLED "OWNER").

**GENTLEMEN:**

The Bidder, in compliance with your invitation for bids for the construction of a Pell City Fire Station #2 having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies; and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within 365 consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of \$ 1,000.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 13 of the General Conditions and further defined in the Supplemental Conditions.

**BIDDER ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDUM:**

The bidder acknowledges receipt of the following Addenda Nos. \_\_\_\_\_ through \_\_\_\_\_.

Bidder acknowledges by initials \_\_\_\_\_ that he/she has read the Specification Section 01 2100- Allowances and has included cost of same in the bid.

**BASE PROPOSAL:**

Bidder agrees to perform all of the work described in the specifications and shown on the plans for the sum of \_\_\_\_\_  
\_\_\_\_\_ (\$ \_\_\_\_\_).

(Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)



**ALTERNATES (REFER TO SPECIFICATION SECTION 01 2300 - ALTERNATES):**

Alternate No. 1: Fixtures FGB in lieu of FGA in Rooms No. 140 & 141 \$ \_\_\_\_\_ Add

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

The apparent low bidder shall submit to the Architect within **24 hours** of bid opening, information as follows:

List of subcontractors, manufacturers of major equipment, vendors, with description of work for each.

Schedule of Values – Dollar Value of subcontractors and purchase orders.

**UPON RECEIPT OF WRITTEN NOTICE OF THE ACCEPTANCE OF THIS BID, BIDDER WILL EXECUTE THE FORMAL CONTRACT ATTACHED WITHIN TEN (10) DAYS AND DELIVER A SURETY BOND OR BONDS AS REQUIRED BY THE BID DOCUMENTS.**

**BID SECURITY**

The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and Evidence of Insurance as stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to comply.

**STATEMENT OF UNDERSTANDING/AUTHORIZED SIGNATURE:**

**IT IS HEREBY ACKNOWLEDGED THAT A BIDDER SUBMITTING A PROPOSAL ACCEPTS ALL PROVISIONS OF THE CONTRACT DOCUMENTS AS PART OF ANY CONTRACT OR PURCHASE RESULTING THERE FROM. IT IS FURTHER ACKNOWLEDGED THAT THE UNDERSIGNED HAS READ AND FULLY UNDERSTANDS THE ENTIRE ADVERTISEMENT FOR BID, FOR PELL CITY FIRE STATION #2 AND WAS IN ATTENDANCE FOR THE MANDATORY PRE-BID CONFERENCE HELD AT , PELL CITY CITY COUNCIL CHAMBERS DECEMBER 5, 20.**

**SIGNED AND SEALED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20XX.**

Name of Bidder:

Business Address:

City/State/Zip:

Telephone:

**AUTHORIZED SIGNATURE:**

Printed Name:

Title:

Date:

STATE OF ( )

COUNTY OF ( )

Sworn to and subscribed before me this \_\_\_\_\_ Day of \_\_\_\_\_, 20xx.

**NOTARY PUBLIC:**

**MY COMMISSION EXPIRES:**

Attachments: Bid Bond or Cashier's Check

**SECTION 00 4321 - ATTACHMENT 'A' TO BID FORM - ACCOUNTING OF SALES TAX**

**To: City of Pell City**

**Date:**

**Name of Project: Pell City Fire Station #2**

**Bid Packages:** \_\_\_\_\_

**SALES TAX ACCOUNTING**

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

	<u>ESTIMATED SALES TAX AMOUNT</u>
BASE BID	\$ _____
Alternate #1	\$ _____

**Failure to provide an accounting of sales tax shall render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.**

Legal Name of Bidder \_\_\_\_\_

Mailing Address \_\_\_\_\_

\*By (Legal Signature) \_\_\_\_\_

\*Name (type or print) \_\_\_\_\_

\*Title \_\_\_\_\_

Date \_\_\_\_\_

Telephone Number \_\_\_\_\_

Date \_\_\_\_\_

STATE OF ( )

COUNTY OF ( )

Sworn to and subscribe before me this \_\_\_\_\_ day of \_\_\_\_\_, 2024

**Notary Public**

**My Commission Expires:**



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

ST: EXC-01  
6/21

# Application For Sales and Use Tax Certificate of Exemption

## FOR GOVERNMENT ENTITY PROJECT

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

### PROJECT INFORMATION:

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

### APPLICANT'S INFORMATION:

RELATION: (CHOOSE ONE)  
 Government Entity     General Contractor     Subcontractor

APPLICANT'S LEGAL NAME	FEIN			
DBA	CONSUMER'S USE TAX ACCOUNT NUMBER			
MAILING ADDRESS: STREET	CITY	STATE	ZIP	COUNTY
CONTACT PERSON	BUSINESS TELEPHONE NUMBER (    )			
EMAIL ADDRESS				

CONTRACT SIGN DATE (PROVIDED BY GENERAL CONTRACTOR)	CONTRACT COMPLETION DATE (PROVIDED BY GENERAL CONTRACTOR)
ESTIMATED START DATE (FOR APPLICANT)	ESTIMATED COMPLETION DATE (FOR APPLICANT)
WILL THE APPLICANT HAVE ANY SUBCONTRACTORS ON THIS JOB? <input type="checkbox"/> Yes <input type="checkbox"/> No    If yes, please attach list.	NAME OF PARTY TO THE CONTRACT
JOB DESCRIPTION	

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE? <input type="checkbox"/> Yes <input type="checkbox"/> No	ESTIMATED POLLUTION CONTROL COST \$
---	--

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

### REVENUE DEPARTMENT USE ONLY

PENDING DOCUMENTATION / INFORMATION:  
 GCL     SBL     Contract / NTP / LOI     LOS     Contract Dates / Breakdown of Costs

Contact Dates: \_\_\_\_\_ Received Date: \_\_\_\_\_  
 \_\_\_\_\_ Forwarded for Denial: \_\_\_\_\_

PROJECT NAME

PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

Individual  Partnership  Corporation  Multi member LLC  Single member LLC  Government Entity

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

OWNERSHIP INFORMATION:

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

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

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

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

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NAME (PLEASE PRINT)

SIGNATURE

TITLE

DATE

**REVENUE DEPARTMENT USE ONLY**

PENDING OTHER:

Government Entity  General Contractor  Not on LOS

Contact Dates: \_\_\_\_\_ Received Date: \_\_\_\_\_

Forwarded for Denial: \_\_\_\_\_

Examiner's Remarks \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Examiner \_\_\_\_\_ Date \_\_\_\_\_

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

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

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

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

**Exempt Entity:**

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

**General Contractor:**

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

**Subcontractor:**

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

**General contractors and subcontractors:**

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

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

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

Fax: (334) 353-7867

Email: STExemptionUnit@revenue.alabama.gov

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

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

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

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

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

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

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

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

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

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

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



Kay Ivey  
Governor

Bill Poole  
Director of Finance

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

P.O. Box 301150, Montgomery, AL 36130-1150  
770 Washington Avenue, Suite 444, Montgomery, AL 36104  
Telephone: (334) 242-4082 Fax: (334) 242-4182



Mickey Allen  
Assistant Finance Director  
Real Property Management

Frank Barnes, Director  
Construction Management

## E-Verify Memorandum of Understanding

Instructions for inclusion in project manuals.

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

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

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



**SECTION 00 4325 - SUBSTITUTION REQUEST FORM - DURING BIDDING/NEGOTIATION**



**Project Name:** \_\_\_\_\_ **Substitution Request No.:** \_\_\_\_\_

\_\_\_\_\_ **From:** \_\_\_\_\_

**To:** \_\_\_\_\_ **Date:** \_\_\_\_\_

\_\_\_\_\_ **CMH Project No.:** \_\_\_\_\_

**Re:** \_\_\_\_\_ **Contract For (Bid Package):** \_\_\_\_\_

**Specification Title:**

**Section No.:** \_\_\_\_\_ **Page:** \_\_\_\_\_

Description: \_\_\_\_\_

Article/Paragraph: \_\_\_\_\_

**Proposed Substitution:**

\_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**Model No.:** \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request: applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

**The Undersigned certifies:**

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design including A/E design, detailing, and construction costs caused by the substitution even if discovery of those costs happens after acceptance of the substitution.

**Submitted by:** \_\_\_\_\_

**Signed by:** \_\_\_\_\_

**Firm:** \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Email: \_\_\_\_\_

**A/E Review and Action**

\_\_\_\_\_ Substitution approved - Make submittals in accordance with Specifications Section 012500 - Substitution Procedures.

\_\_\_\_\_ Substitution approved as noted - Make submittals in accordance with Specifications Section 012500 - Substitution Procedures.

\_\_\_\_\_ Substitution rejected - Use specified materials

\_\_\_\_\_ Substitution Request received too late - Use specified materials

**Reveiwed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

<b>Supporting Data Attached:</b>	<input type="checkbox"/> <b>Drawings</b>	<input type="checkbox"/> <b>Product Data</b>	<input type="checkbox"/> <b>Samples</b>
	<input type="checkbox"/> <b>Tests</b>	<input type="checkbox"/> <b>Reports</b>	<input type="checkbox"/> <b>Other</b>

**END OF SECTION**

**SECTION 00 4326 - REQUEST FOR INFORMATION – DURING BIDDING/NEGOTIATION**



**Project Name:** \_\_\_\_\_ **RFI No:** \_\_\_\_\_

\_\_\_\_\_ **From:** \_\_\_\_\_

**To:** \_\_\_\_\_ **Date:** \_\_\_\_\_

\_\_\_\_\_ **CMH Project No.:** \_\_\_\_\_

**Contract For (Bid Package):** \_\_\_\_\_

---

**Request (attach additional sheets if required)**      **Date response required:**

**Drawing Sheets (reference):**

**Spec Sections (reference):**

By Signing and submitting this form the Contractor confirms that he has thoroughly researched all the Contract Documents prior to the submittal of the above referenced Request for Information (RFI).

In cases where it is determined by the Architect that the information requested and design intent have been indicated or included in the contract documents and is readily available to persons skilled in reading and understanding construction documents, the Architect will not respond to the RFI.

Where the information requested is requires modification or clarification of the construction documents, the Architect will issue the information in an Addendum.

**Contractors Acceptance**

**By:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**RESPONSE**

**DATE:**

**ANSWERED BY:** \_\_\_\_\_

**COMPANY:** \_\_\_\_\_

**SECTION 00 5000  
CONTRACTING FORMS AND SUPPLEMENTS**

**PART 1 GENERAL****1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.**

- A. Copies of the printed AIA Documents, may be purchased from the office of the Birmingham Chapter of the American Institute of Architects, 109 Richard Arrington Jr. Boulevard, Birmingham, AL 35233 or from the American Institute of Architects, 1735 New York Avenue, NW, Washington D.C. 20006.
- B. Electronic copies may be purchased and downloaded at [www.AIA.org](http://www.AIA.org).
- C. AIA documents are intended to be used as "consumables" and it is an infringement of the AIA copyright to reproduce blank documents. After the original document has been filled in, ten copies of the completed document may be made for that specific project.

**1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT**

- A. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.
- B. The Agreement is based on AIA A101.
- C. The General Conditions are based on AIA A201.

**1.03 FORMS**

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.
- B. Bond Forms:
  - 1. Bid Bond Form: AIA A310.
  - 2. Performance and Payment Bond Form: AIA A312.
- C. Post-Award Certificates and Other Forms:
  - 1. Schedule of Values Form: AIA G703.
  - 2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
- D. Clarification and Modification Forms:
  - 1. Request for Interpretation Form ( During the Bidding/Negotiating Stage): Document 00 6315.
  - 2. Request for Interpretation Form ( After the Bidding/Negotiating Stage): Document 00 6326.
  - 3. Substitution Request Form: (During the Bidding/Negotiating Stage) Document 00 4325.
  - 4. Substitution Request Form (During Construction): Document 00 6325.
  - 5. Architect's Supplemental Instructions Form: Document 00 6328.
  - 6. Construction Change Directive Form: Document 00 6330.
  - 7. Request for Proposal Form: Document 00 6332.
  - 8. Change Order Form: AIA G701.
- E. Closeout Forms:
  - 1. Certificate of Substantial Completion Form: AIA G704.
  - 2. Waiver of Lien Form: Document 00 5039.
  - 3. Consent of Surety to Final Payment Form: AIA G707.

**1.04 REFERENCE STANDARDS**

- A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2017.
- B. AIA A201 - General Conditions of the Contract for Construction; 2017.
- C. AIA A310 - Bid Bond; 2010.
- D. AIA A312 - Performance Bond and Payment Bond; 2010.

- E. AIA G701 - Change Order; 2017.
- F. AIA G702 - Application and Certificate for Payment; 1992.
- G. AIA G703 - Continuation Sheet; 1992.
- H. AIA G704 - Certificate of Substantial Completion; 2017.
- I. AIA G707 - Consent of Surety to Final Payment; 1994.
- J. AIA G710 - Architect's Supplemental Instructions; 2017.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 00 5038  
PARTIAL RELEASE OF LIEN**

**DATE:** \_\_\_\_\_  
**NAME OF FIRM:** \_\_\_\_\_

<b>Total Contract Amount:</b>	\$ _____
<b>Percent of Contract Complete:</b>	_____ %
<b>Value of Contract Complete:</b>	\$ _____
<b>Previous Amount Paid:</b>	*\$ _____
<b>Amount due this Application</b>	\$ _____

The undersigned Lien, in consideration of value received, hereby releases its lien and right to claim a Lien to the extent of \$ \_\_\_\_\_, or for labor, services, or materials furnished through, \_\_\_\_\_ except

\_\_\_\_\_  
\_\_\_\_\_

to the following property:

Dated on \_\_\_\_\_, 20\_\_\_\_.

**LIEN** \_\_\_\_\_

Signed, sealed and delivered in the presence of:

\_\_\_\_\_  
**NOTARY**

\_\_\_\_\_

**SECTION 00 5039  
WAIVER OF LIEN**

**KNOW ALL BY THESE PRESENTS: THAT**

\_\_\_\_\_  
\_\_\_\_\_

*For and in consideration of \_\_\_\_\_ Dollars and other good and valuable considerations, lawful money of the United States of America, to me in hand paid, the receipt whereof is hereby acknowledged, does hereby waive, release, remise and relinquish any and all right to claim any lien or liens for work done or material furnished or any kind or class of lien whatsoever on the following described property:*

**DATED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20XX**

**AT \_\_\_\_\_**

**BY \_\_\_\_\_**

*Signed, sealed and delivered in the presence of:*

\_\_\_\_\_  
**NOTARY**

\_\_\_\_\_



SECTION 00 6325 - SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION



**Project Name:** \_\_\_\_\_ **Substitution Request No.:** \_\_\_\_\_

\_\_\_\_\_ **From:** \_\_\_\_\_

**To:** \_\_\_\_\_ **Date:** \_\_\_\_\_

\_\_\_\_\_ **CMH Project No.:** \_\_\_\_\_

**Re:** \_\_\_\_\_ **Contract For (Bid Package):** \_\_\_\_\_

**Specification Title:** \_\_\_\_\_

Description: \_\_\_\_\_

Article/ Paragraph: \_\_\_\_\_

**Proposed Substitution:** \_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**Trade Name:** \_\_\_\_\_ **Model No.:** \_\_\_\_\_

**Installer:** \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**Product History:** \_\_\_ New Product \_\_\_ 1-4 years \_\_\_ 5-10 years \_\_\_ More than 10 years

**Differences between proposed substitution and specified product:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_ Point-by-point comparative data attached (REQUIRED)

**Reason for not providing specified item:**

\_\_\_\_\_  
\_\_\_\_\_

**Similar Installation:**

Project: \_\_\_\_\_ Architect: \_\_\_\_\_

Address: \_\_\_\_\_

Owner: \_\_\_\_\_

Date Installed: \_\_\_\_\_

**Proposed substitution affects other parts of Work:  No  Yes; explain**

\_\_\_\_\_  
\_\_\_\_\_

**Savings to the Owner for accepting substitution:**

\_\_\_\_\_ (\$ \_\_\_\_\_)

**Proposed substitution changes in Contract Time:  No  Yes add/deduct \_\_\_\_\_ days.**

**Supporting Data Attached:  Drawings  Product Data  Samples  
 Tests  Reports  Other**

**The undersigned certifies:**

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

**Submitted by:** \_\_\_\_\_

**Signed by:** \_\_\_\_\_

**Firm:** \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_

Email: \_\_\_\_\_

**A/E Review and Recommendation**

- \_\_\_\_\_ Approve Substitution - Make submittals in accordance with Specification Section 013001 - Submittals.
- \_\_\_\_\_ Approve Substitution as noted - Make submittals in accordance with Specification Section 013001 - Submittals
- \_\_\_\_\_ Reject Substitution - Use specified materials
- \_\_\_\_\_ Substitution Request received too late - Use specified materials.

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Owner's Review and Action**

- \_\_\_\_\_ Substitution approved - Make submittals in accordance with Specification Section 013001 - Submittals. Prepare Change Order.
- \_\_\_\_\_ Substitution approved as noted - Make submittals in accordance with Specification Section 013001 - Submittals. Prepare Change Order.
- \_\_\_\_\_ Substitution rejected - Use specified materials.

**Signed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Additional Comments:**

\_\_\_\_\_ Contractor \_\_\_\_\_ Subcontractor \_\_\_\_\_ Supplier \_\_\_\_\_ Manufacturer \_\_\_\_\_ A/E

SECTION 00 6326 - REQUEST FOR INFORMATION – DURING CONSTRUCTION



Project Name: \_\_\_\_\_ RFI No: \_\_\_\_\_

\_\_\_\_\_ From: \_\_\_\_\_

To: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ CMH Project No.: \_\_\_\_\_

Contract For (Bid Package): \_\_\_\_\_

Request (attach additional sheets if required) Date response required:

Drawing Sheets (reference):

Spec Sections (reference):

By Signing and submitting this form the Contractor confirms that he has thoroughly researched all the Contract Documents prior to the submittal of the above referenced Request for Information (RFI).

In cases where it is determined by the Architect that the information requested and design intent have been indicated or included in the contract documents and is readily available to persons skilled in reading and understanding construction documents, The Contractor agrees that he will compensate the Architect for time spent researching the Contract Documents.

The minimum charge for responding to the RFI under the above conditions will be 2.65 x Direct Personnel Expense (DPE) with a one (1) hour minimum time charge.

Where the information requested is requires modification or clarification of the construction documents, the Architect will issue the information in an Addendum.

Contractors Acceptance

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

RESPONSE

DATE:

ANSWERED BY: \_\_\_\_\_

**COMPANY:** \_\_\_\_\_

SECTION 00 6328 - ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS



Project Name: \_\_\_\_\_ ASI No: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

To Contractor: \_\_\_\_\_ CMH Project No: \_\_\_\_\_

\_\_\_\_\_ Contract For (Bid Package) : \_\_\_\_\_

The Supplemental Instructions summarized below shall serve to document a request for clarification or additional information and is issued in accordance with the Contract Documents. The document does not authorize contractor to proceed with work that impacts Contract Sum or Contract Time. If these instructions impact Contract Sum or Contract Time, the Contractor shall submit a Change Order Request to the Architect and get written approval prior to proceeding with these instructions.

Description - written summary of the instructions:

Attachments - list of attached documents that support the instructions:

Requested By: \_\_\_\_\_

Printed Name:

Company:

cc:		via	
		via	
		via	



		<b>via</b>	
--	--	------------	--



SECTION 00 6332 - REQUEST FOR PROPOSAL



Project Name: \_\_\_\_\_ RFP No: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

To Contractor: \_\_\_\_\_ CMH Project No: \_\_\_\_\_

\_\_\_\_\_ Contract For (Bid Package) : \_\_\_\_\_

Please submit an itemized proposal for changes in the Contract Sum and the Contract Time for the proposed modifications to the Contract Documents described herein. Submit proposal within 10 working days of the date of this request or notify the CMH Architects, Inc. in writing of the date you anticipate submitting your proposal if additional time is required to respond to this request.

This is not a Change Order, a Construction Change Directive or a Direction to Proceed with the work described in the proposed modifications.

Description - written summary of the modifications requested:

Attachments - list of attached documents that support the request:

Requested By: \_\_\_\_\_

Printed Name:

Company:

cc:		via	
		via	
		via	



1800 International Park Drive  
Suite 300  
Birmingham, AL 35243

205 / 969-2696  
info@cmharch.com  
www.cmharch.com

**ELECTRONIC FILE TRANSFER AGREEMENT:**

**REQUESTED BY:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CMH Architects, Inc.  
1800 International Park Drive  
Suite 300  
Birmingham, Alabama 35243

**Agreement:** \_\_\_\_\_ desires to have CMH Architects, Inc. supply the electronic media for the \_\_\_\_\_ project shall provide a list of files/drawings they wish to receive by electronic media.

Therefore, \_\_\_\_\_ agrees as follows:

1. The electronic files furnished by CMH Architects, Inc. are submitted for an acceptance period of thirty (30) days. Any defects the recipient discovers during this period will be reported to CMH Architects, Inc.
2. \_\_\_\_\_ recognizes that use of such electronic media will be at \_\_\_\_\_'s sole risk and without any liability risk or legal exposure to CMH Architects. Furthermore, \_\_\_\_\_ shall, to the fullest extent permitted by law, defend, indemnify and hold harmless CMH Architects from all claims, damages, losses and expenses including attorney fees arising out of or resulting from the use of such electronic media (disk).
3. Under no circumstances shall transfer of the drawings and other electronic media for use by \_\_\_\_\_ be deemed a sale by CMH Architects, and CMH Architects makes no warranties, either expressed or implied, for any purpose.
4. The use of this electronic media is restricted to the original site for which it was prepared. Material shall not be transferred to any other party for use in other projects. Reuse or reproduction of the documents (whole or in part) for any other purpose for which the material was not strictly intended is prohibited. Title to these

documents is prima facie evidence of the acceptance of these restrictions.

- 5. \_\_\_\_\_ recognizes that information stored on electronic media including, but not limited to, computer disk may not be 100% compatible with his system, therefore, \_\_\_\_\_ agrees that CMH Architects shall not be liable for the completeness or accuracy of any materials provided due to difference in computer and software systems.
- 6. \_\_\_\_\_ recognizes that information stored on electronic media including, but not limited to computer disk may be subject to undetectable alteration and/or uncontrollable deterioration. \_\_\_\_\_ Therefore agrees that CMH Architects shall not be liable for the completeness or accuracy of any materials provided on electronic media.
- 7. \_\_\_\_\_ agrees that the information furnished on the electronic media cannot be deemed as data for record purposes, since the information is open to alterations, modifications, and/or changes.
- 8. CMH shall furnish requested Construction Documents in .DWG AutoCAD format along with a final index of all drawing files transferred. This will become an attachment to this document, a copy of which shall be signed acknowledging receipt and returned to CMH. If acknowledgement is not received, it shall be deemed all files were received as listed.

All terms and conditions above are hereby agreed to and accepted in their entirety as a condition of receipt of the referenced CADD files. Use of the electronic media indicates agreement of this form.

Agreed to this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

**SECTION 00 7300  
SUPPLEMENTARY CONDITIONS AIA 201-2017**

**PART 1 GENERAL****1.01 SUMMARY**

- A. These Supplementary Conditions amend and supplement the General Conditions defined and identified for use on this project and other provisions of the Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

**1.02 RELATED SECTIONS**

- A. Section 00 5000 - Contracting Forms and Supplements.

**1.03 MODIFICATIONS TO GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION  
AIA DOCUMENT A201 - 2017****TABLE OF ARTICLES****ADD THE FOLLOWING NEW ARTICLES****16 APPLICABLE PUBLICATIONS (SUPPLEMENTARY)****17 GUARANTEE (SUPPLEMENTARY)****ARTICLE 1 GENERAL PROVISIONS****1.1 Basis Definitions****ADD THE FOLLOWING AT THE END OF SUBPARAGRAPH 1.1.1:**

All questions relative to the Contract Documents shall be addressed to the Architect for clarification. In the event of any conflict/ inconsistencies in the Contract Documents for the Described Work, the following take precedence:

- A. The Agreement (Contract)
- B. Addenda
- C. Supplementary Conditions
- D. General Conditions of the Contract
- E. Specifications
- F. Drawings

In event of conflict between Drawings and Specifications, the stricter or higher quality shall prevail.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**1.1.6.1** The reference standards referred to in the Specifications references the edition current as of the date of the documents. References to non-proprietary standards, codes and specifications, and the manufacturer's specifications, instructions and directions mean the date included with such reference. Where no date is given, references will mean the latest edition in effect on the date of the documents. Such references require that the Contractor become fully and adequately informed of the contents of such directions, specifications and codes, and will properly apply that information so that the best possible use of the item, material or technique is achieved. Before such referenced information is utilized in the Work, the Architect may request the Contractor to use editions of later date than specified. If a difference in cost is necessary, the Contract Sum will be adjusted by Change Order.

**ADD THE FOLLOWING SUBPARAGRAPHS:****1.1.9 Miscellaneous Definitions**

**1.1.9.1 AS SHOWN:** As shown in the Drawings.

**1.1.9.1.1** The term used in these Supplementary Conditions includes materials systems and equipment. Where items, systems, etc are referred to in the singular, such reference does not limit the quantity required. Furnish quantities as required to complete the work.

**1.1.9.2** Whenever the words 'furnish', 'install', 'provide', or equivalent words are used they mean that it will be the responsibility of the designated trade contractor to furnish and completely install the device, equipment, or material named, together with all associated devices, equipment, materials, wiring, piping, etc. as may be required for a complete and operating installation.

**1.1.9.3** Architect: The firm CMH Architects, Inc. is the Architect. Where the word 'architect' is used it refers to an authorized representative of the Architect.

**1.1.9.4** Owner: Where the word 'Owner' is used it refers to an authorized representative of the Owner.

**1.1.9.5** DIRECTED, SELECTED, and/or APPROVED: Directed, Selected and/or Approved by the Architect.

**1.1.9.6** EQUAL: Equal in quality and money value and similar in design or properties, in the Architect's opinion.

## **1.2 Correlation, and Intent of the Contract Documents**

### **ADD THE FOLLOWING SUBPARAGRAPHS:**

**1.2.1.2** The precedence of the Contract Documents is as follows:

- A. The Agreement (Contract).
- B. Addenda: Modifications of any nature to the Construction Documents take precedence over the original Construction Documents.
- C. Supplementary Conditions.
- D. General Conditions.
- E. Specifications: Should there be a conflict among the specifications; the Architect will decide which stipulation will provide the best installation.
- F. Contract Drawings: Drawings of a larger scale take precedence over those of smaller; figured dimensions take precedence over scaled dimensions; and noted materials take precedence over graphic indications.

**1.2.1.3** Where Contract Drawings show only a portion of the work in full detail and the remainder is shown only in outline, execute the portions in outline as required for like portions shown in full detail. Where ornament or other detail is shown by starting only, continue detail throughout the parts in which it is shown and throughout all other similar parts of the work unless otherwise explicitly required. Where items are shown in diagrammatic/schematic drawings, verify location with the Architect before installation.

### **ADD THE FOLLOWING SUBPARAGRAPH:**

**1.2.4** In the case of conflicts, discrepancies or inconsistency between Drawings and Specifications or within either Document not clarified by addendum or construction bulletin, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

## **ARTICLE 2 OWNER**

### **2.1 General**

#### **ADD THE FOLLOWING TO THE END OF SUBPARAGRAPH 2.1.1:**

The term "Owner" shall also indicate all assignees and transferees of Owner.

### **2.2 Evidence of Owner's Financial Arrangements**

**DELETE SUBPARAGRAPH 2.2.1 IN ITS ENTIRETY.**

**2.3 Information and Services Required of the Owner****DELETE SUBPARAGRAPH 2.3.6 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:**

**2.3.6** The General Contractor will be furnished up to Four (4) complete copies of the drawings and specifications for the execution of the Work. Additional sets of the drawings and specifications will be furnished at the cost of reproduction, postage and handling. Keep one (1) copy of the current drawings and specifications for use of any interested parties. The Architect will furnish the Contractor two (2) copies, free of charge, of all supplementary drawings, change order requests and large scale details as necessary for clarification of the work and any Change Order Requests.

**2.5 Owner's Right to Carry Out the Work****DELETE SUBPARAGRAPH 2.5 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:****2.5 Owner's Right to Carry Out the Work**

If the Contractor defaults neglects to carry out the work in accordance with the Contract Documents or fails within a three (3) day period, such default or neglect with diligence and promptness, the Owner after such three (3) day period, without prejudice to any other remedies the Owner may have, correct such deficiencies and deduct by Change Order the payments due the Contractor, the cost of correcting such deficiencies. Cost for correcting deficiencies includes actual costs incurred by the Owner as well as compensation for additional services of the Architect and their respective consultants. If payment then or thereafter due the Contractor is not sufficient to cover such amounts, the Contractor must pay the difference to the Owner.

**ARTICLE 3 - CONTRACTOR****3.2 Review of Contract Documents and Field Conditions by Contractor****ADD THE FOLLOWING SUBPARAGRAPH:**

**3.2.1.1** The Contractor shall thoroughly examine all factors reasonably available to him, including but not limited to the Drawings, Specifications, project soils report, site boundary and topograph, site conditions site history, local information, and seasonal weather conditions. Soils reports data is not considered all conclusive and it is the Contractor's responsibility to further investigate site conditions as he determines necessary. The Site Contractor shall be totally responsible for acceptance of the site and preparation of the site to the proper grade and compaction requirements as indicated by the Civil Drawings and Specifications. Any construction performed by the General Contractor on a building pad prepared by others will constitute acceptance of the pad by the General Contractor.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**3.2.2.1** The Contractor shall be responsible for the accuracy of measurements, elevations, lines and grades of work. If Contractor chooses to measure distance by scaling from the Drawings, it is totally at his risk and is not considered by Owner/Architect to be an accurate measurement. Contractor shall do field work necessary to lay out and maintain the work. Differences which may be found between Drawings and actual conditions shall be submitted to the Owner/Architect for his consideration before proceeding with the work.

**ADD THE FOLLOWING NEW SUBPARAGRAPH:**

**3.2.5** The Contractor is responsible for having a thorough knowledge of all Drawings, Specifications, General Supplementary, and Special Conditions, and other Contract Documents. Failure to acquaint himself with this knowledge does not relieve him of the responsibility for performing his work in a manner acceptable to the Owner. No additional compensation will be allowed because of conditions that occur due to failure by the Contractor to familiarize himself and all works with this knowledge.

**3.2 Supervision and Construction Procedures****ADD THE FOLLOWING TO THE END OF SUBPARAGRAPH 3.3.1:**

Contractor agrees upon request of the Owner/Architect, to change any sequence of work provided such change does not cause delay in the completion of work or increase the cost. If such a change does cause a delay or increase the cost, a change order maybe issued extending the time of completion and/or changes in cost.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**3.3.1.1** The Owner/Architect reserve the right to approve the Contractor's Project Manager and/or Superintendent assigned to this project. The Owner/Architect also reserves the right to reject any of the Contractor's personnel assigned to this project, and have the Contractor replace such personnel with acceptable, qualified personnel within 5 working days prior to beginning and during course of work

**3.4 Labor and Materials**

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**3.4.4** All manufactured articles, materials and equipment must be supplied, installed, connected, erected, used, cleansed and conditioned in accordance with the manufacturer's specifications unless otherwise specified.

**3.4.5** The Contractor agrees that neither he nor his subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to his hire, tenure, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of age, sex, race, color, religion, national origin or ancestry. Breach of this covenant may be regarded as a material breach of this Contract.

**3.4.6** Comply with all applicable State and Federal statues regarding minimum wages to be paid. The Contract Sum will not be increased because of subsequent increases in the wage rates.

**3.5 Warranty**

**ADD THE FOLLOWING TO THE END OF PARAGRAPH 3.5:**

All warranty periods will start at the date of Substantial Completion as defined in paragraph 9.8.

**MODIFY PARAGRAPH 3.5 AS FOLLOWS:**

**DELETE** the word "may" in line five of **Paragraph 3.5** and substitute the word "will".

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**3.5.3** Workmanship and installation must be the best quality possible. Perform each part of the work and related activities with the best possible workmanship to produce work that is neat, secure, weatherproof, with the best possible appearance and utility.

**3.5.4** The Architect will be the sole judge of all installed work, and may reject work that does not conform to the requirements of the Contract Documents. Repair or replace rejected work to the satisfaction of the Architect without additional cost to the Owner.

**3.4.5** Contractor does hereby warranty and covenant to Owner that all materials and workmanship shall be of the highest quality, in accordance with the Contract Documents and free from defects that if any portion of Work is not of the highest quality, in accordance with the contractor Documents and free from defects, Contractor shall, upon the request of Owner, for a period of one year from the date of Grand Opening or Substantial Completion, whichever is later, of the Work under the Contract, promptly correct such non-compliance or defect. For the purposes of ascertaining the quality and performance standards required by this warranty and ascertaining the Contractor's responsibility in cases where the required performance standard has not been met. Owner and Contractor agree that they shall be guided by the performance standard for workmanship, materials, systems, and structures deemed appropriate by the Architect except for the following standards which shall be set forth:

- .1 Should there be any conflict between the3 local and state Building Codes, the quality of standard for sound industry practices with regard to materials or workmanship, and the

quality standard required by the Contract Documents, the higher standard shall govern.

.2 See additional and specific warranty information as specified in Sections 2 through 16.

**3.5.6** Contractor will at all times provide proper facilities and an opportunity for the inspection of the Work by the Architect and Owner and their representatives. Contractor shall, within twenty-four (24) hours after receiving written notice from Architect proceed to take down and remove all portions of the Work which shall have been condemned as unsound, improper, or in any way failing to conform to the Contract Documents and shall replace with same with proper and satisfactory Work make good all work damaged or destroyed thereby at no cost to the Owner. Failure to discover or notify Contractor of defective or nonconforming work by Architect or Owner shall not relieve Contractor of full responsibility for replacement of the defective or nonconforming Work and all damages resulting therefrom.

### **3.6 Taxes**

#### **ADD THE FOLLOWING TO THE END OF PARAGRAPH 3.6:**

In the event this project is constructed in an area where governmental jurisdiction requires income tax to be withheld, the contractor shall comply with the requirements in a manner that will absolve the Owner of any withholding liability.

#### **ADD FOLLOWING SUBPARAGRAPH:**

**3.6.1** All applicable taxes are to be included in the contract sum for the project.

### **3.7 Permits, Fees, Notices and Compliance with Laws**

#### **ADD THE FOLLOWING SUBPARAGRAPH:**

**3.7.1.1** All Contractors performing work must be licensed as required by the state, county, and/or municipality having jurisdiction. Transmit copies of license certificate to the Architect and Owner within ten (10) days following the execution of the contract.

#### **DELETE SUBPARAGRAPH 3.7.2 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

**3.7.2** The Contractor shall be totally responsible for compliance with all notices under all licensing laws and other statutory requirements which apply to himself or any Subcontractor actively engaged in any work on the project.

#### **ADD THE FOLLOWING TO THE END OF SUBPARAGRAPH 3.7.3:**

The Contractor's work includes, without limitation, all disposal or removal of waste and rubbish attributed to the project and warrants that it is familiar with all applicable federal, state and local laws and ordinances concerning disposal of waste and rubbish.

### **3.10 Contractor's Construction and Submittal Schedule**

#### **ADD THE FOLLOWING SUBPARAGRAPHS:**

**3.10.4** Should the Contractor fail to complete his Work within the time allowed by the Project schedule, including extensions of time that the Contractor may be entitled to under the Contract documents unless the Owner elects to accelerate the work, Contractor will be responsible for paying the Owner all additional costs incurred by the Owner's consultants and sub consultants hired in conjunction with the execution of the late Work and will be subject to liquidated damages as defined in the contract. The period that the Contractor will be responsible for such costs is from the point that the Contractor's work activity exceeded the scheduled completion dates until the date of actual substantial completion of that particular activity.

### **3.13 Use of Site**

#### **ADD THE FOLLOWING TO THE END OF PARAGRAPH 3.13:**

The Contractor shall comply with all instructions of the Owner given to it with regards to the use of site.

### **3.18 Indemnification**



**DELETE SUBPARAGRAPH 3.18.1 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

**3.18.1** To the fullest extent permitted by law, the Contractors shall indemnify and hold harmless the Owner, Owner's Lender, 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 attorney's fees, arising out of or resulting from performance of the Work including but not limited to spilling or dumping of hazardous waste materials at or upon the construction site, 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) including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether 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 which would otherwise exist as to a party or person described in this Paragraph 3.18 of the General Conditions.

**ARTICLE 5 - SUBCONTRACTORS**

**5.1 Definitions**

**ADD THE FOLLOWING SUBPARAGRAPH:**

**5.1.1.1** Any Subcontractor performing work must be licensed as required by the State, County, and/or municipality having jurisdiction. Transmit copies of license certificates to the Architect and Owner within ten (10) days following the execution of the Contract.

**ADD THE FOLLOWING NEW PARAGRAPH AND SUBPARAGRAPHS:**

**5.5 Subcontractor Duties**

**5.5.1** All Subcontractors will participate in installing and removing general temporary protection measures and completing a nightly cleaning at the end of each work shift. Participation will be proportional to the level of manpower present on the site for given night's work.

**5.5.2** All Subcontractors will be provided with a temporary utility source, toilet facilities, and dumpster (for common trash). All other general conditions, temporary facilities, staging components, scaffolding, hoisting, conveyance equipment, etc. required for the completion of its scope of work shall be furnished, installed, and subsequently removed by Subcontractor.

**5.5.3** All Subcontractors will perform a daily cleanup of its debris. All common trash may be placed in the General Contractor furnished project dumpster. All bulk debris resulting from Subcontractor's scope of work will be properly disposed of off site by Subcontractor.

**ARTICLE 7 - CHANGES IN THE WORK**

**7.1 General**

**ADD THE FOLLOWING TO THE END OF THE SUBPARAGRAPH 7.1.1:**

No Change Orders, Construction Change Directive or order for minor change in the work will be considered unless approved by the Owner in writing prior to the work being performed.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**7.1.1.1** It is agreed the Owner has the right to request changes during performance of the Contract for Construction. The Contractor agrees to perform those requested changes for a fair and reasonable cost/credit and within the time directed the Owner, whether the change requires an increase or a decrease to the scope of the work.

- a.** A fair and reasonable cost is defined as not greater than the current industry standard for the type of work and circumstances under which it is to be performed. Means Construction Cost Data, latest edition, with locality factors taken under consideration, will be used as a guide and costs may not be higher without sufficient documentation to, in the Architect's judgment, substantiate the increase. The Architect may also check cost

against current similar work on other projects.

b. A fair and reasonable time extension is defined as the net increase to the overall project schedule, as sufficiently documented by the Contractor and clearly determined justifiable by the Architect's review of the current Project Schedule. A request for a time extension must accompany any and all of the Contractor's cost proposal submittals or no additional time will be allowed.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**7.1.4** If the net value of a change results in a Credit to the Owner, the Credit shall be the net without profit and overhead.

**7.3 Change Orders**

**DELETE SUBPARAGRAPH 7.2.1.2 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

.2 The amount of the adjustment or non-adjustment in the Contract Sum, if any.

**DELETE SUBPARAGRAPH 7.2.1.3 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

.3 The extent of the adjustment or non-adjustment in the Contract Time, if any.

**7.3 Construction Change Directives**

**CLARIFICATION OF SUBPARAGRAPH 7.3:**

The phrase "...if not such amount is set forth in the Agreement, a reasonable amount..." is interpreted to mean not more than a total of 25% for Contractor, Subcontractor and Sub-subcontractors (where applicable). Where the Contractor is performing the work with his own forces, the maximum allowable markup for:

- a. Where the Contractor is performing the work with his own forces, the maximum allowable markup for overhead and profit is 15%.
- b. Where a Subcontractor is performing the work, the maximum allowable markup for overhead and profit is 15% for the Subcontractor and his sub-subcontractors and 10% for the Contractor.
- c. Cost of the work is limited to cost of materials, delivery, labor, applicable payroll taxes, Workman's Compensation Insurance, rental of power tools/equipment, and bond premiums and permits.
1. d. Overhead is defined as, supervision, superintendence, time keepers, watchmen, clerks, small tools, general office expense and other expenses not included in the "costs" above.

**ARTICLE 8 - TIME**

**8.1 Definitions**

**ADD THE FOLLOWING SUBPARAGRAPH:**

**8.2.1** Notice to Proceed will be issued. Obtain necessary insurance and permits, file documents and notices and commence the Work as soon as notified. Five (5) calendar days will be allowed for mobilization.

**8.2 Progress and Completion**

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**8.2.4** It is the intent that the owner issue Notice to Proceed no later than ten (10) calendar days after receipt of bids.

**8.3 Delays and Extension of Time**

**ADD THE FOLLOWING TO THE END OF SUBPARAGRAPH 8.3.1:**

In the event that in the opinion of the Owner, in order to meet the construction schedule and to complete the work within the time specified by this Agreement, the Contractor needs to employ additional personnel and labor and to have such employees work on an overtime basis, in order to meet such Contractor's schedule and the completion dates as as required by this

Agreement, then the Contractor agrees to immediately comply with such instructions as are given with regard thereto at no additional cost to the Owner. However, nothing in this paragraph supersedes Paragraph 8.3.1 of General Conditions. If the Contractor is delayed by causes beyond its control, the Owner may by written authorization to the Contractor accelerate the time of completion. As a result, the Contractor at the Owner's expense will employ additional personnel and labor and have such employees work on an overtime basis. The cost of this overtime work will be reported to the Owner weekly and may be terminated by the Owner at any time.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**8.3.4** Should a Contractor fail to complete his work within the time allowed by the Project Schedule at no one's fault but his own, he will be responsible for paying the Owner all costs incurred for the Owner's consultants and sub-consultants hired in conjunction with the execution of the work. The period that the Contractor will be responsible for such costs is from the point that the Contractor's work exceeded the scheduled completion date until the date of actual Substantial Completion.

**ADD NEW PARAGRAPH 8.4 INCLUDING SUBPARAGRAPHS AS FOLLOWS:**

**8.4 Reimbursement of Consultants**

**8.4.1** The involved Contractor is responsible for paying the Owner all costs incurred for consultants, including sub-consultants hired in the performance of the Work, including their overhead and profit, relative to the project during the following period:

**8.4.1.1** After the Contract Time, as defined in this Article, has expired, until the actual date of Substantial Completion or Final Completion.

**ARTICLE 9 - PAYMENTS AND COMPLETION**

**9.2 Schedule of Values**

**ADD THE FOLLOWING SUBPARAGRAPH:**

**9.2.1** All pay request forms are to be G702, Application and Certificate for Payment and must be supported by the AIA document G703 continuation sheet. Submit three (3) notarized applications monthly. Documents must be submitted digitally.

**9.3.1 Application for Payment**

**DELETE SUBPARAGRAPH 9.3.1 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

**9.3.1** All payments must be submitted to the Owner for review and processing on AIA forms G-702 (certificate and application for payment) and AIA G-703 (continuation Sheet), or an Owner's approved equal, three original copies. Such application shall be notarized, and supported by such data substantiating the Contractor's right to payment, such as copies of requisitions from subcontractors and material suppliers. The Owner shall determine the amount less retainage of each Application for Payment that is properly due and will issue payment for such amount, if Owners Lender does not reasonably object to such payment, no later than twenty (20) days after the first day of the next month following the period covered by the Application for Payment, provided the properly completed Application for Payment is in Owner's possession not later than the 1st day of the month.

**ADD FOLLOWING TO END OF SUBPARAGRAPH 9.3.1.1:**

Application for Payment shall be on AIA Document G-702 and G-703. All listings of items to agree with the Schedule of Values (Paragraph 9.2). Submit documents electronically.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**9.3.1.3** The Contractor shall properly complete and submit fully executed Release of Lien with each Application for Payment. No payment will be issued without the fully executed Lien Waiver. This must be accompanied by fully executed Lien Waivers from all appropriate Subcontractors and Suppliers involved in the preceding Application for Payment.

**ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 9.3.3:**

.1 In the event Owner receives information that indicates a lien has been filed or that there exists a potential lien situation, the Contractor will be notified by the Owner and they will expect the Contractor to immediately resolve the situation to the satisfaction of the Owner. All monies requested for this pay period, as described in Part 9.3.1, shall be withheld until such liens have been removed and the dispute rectified.

.2 It is hereby agreed between the Owner and the Contractor that each properly executed Monthly Receipt and Release of Lien form is a valid lien release form, the Contractor thereby agrees to defend and indemnify the Owner against any and all claims resulting from a lien against the property.

.3 Payment for materials stored off site will not be made by Owner without prior approval by the Architect. Also, Contractor submitting request for payment of stored materials must attach proof of adequate insurance coverage of such materials and conveyance to the site to the pay request for the month they are making such request.

**9.6 Progress Payments****ADD THE FOLLOWING SUBPARAGRAPH:**

**9.6.2.1** All monies paid on account to Contractor for materials or labor used in the performance of the Work will be regarded as funds held in trust solely for payment of any and all of Contractor's obligations relating to or arising out of the Work including the payment of all subcontractors and suppliers of the contractor who have supplied labor, equipment, or materials or performed any work whatsoever on this Project.

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**9.6.9** Procedures for processing payments for stored materials and release of retainage:

**9.6.9.1** The amount of retainage that will be withheld from partial payments will be 10% for the first 50% of the value of the estimated work performed and the value of materials stored on-site or stored off-site in compliance with paragraph 9.3.3.3. then 0% after that. With regards to materials stored off-site, the Architect must receive proof of adequate insurance of such materials; must approve the storage facility in which they are placed; and must verify both the quantity and quality of such materials, all before the Contractor's application for partial payment will be processed.

**9.6.9.2** Upon completion of the construction project and completion of the punch list, the Owner will pay 100% of the amount due the Contractor less retainage. Upon completion of all close-out requirements, including submission of all applicable releases, record documents and warranties, the Owner will pay all retainage. No partial retainage will be paid before all close-out items are complete.

**9.6.9.3** Substantial Completion (completion of punch lists) must be achieved within the time limits established in the Project Schedule for each phase to relieve the Contractor of responsibility for liquidated damages (if called for).

**9.8 Substantial Completion****ADD THE FOLLOWING SUBPARAGRAPH:**

**9.8.1.1** The date of commencement of Work and the date of Substantial Completion shall be agreed upon between the Owner and the Contractor at the time of Contract award and shall be made part of the Construction Agreement between the Owner and Contractor.

**ADD THE FOLLOWING SUBPARAGRAPH:**

**9.8.6** Substantial Completion (completion of punch lists) must be achieved within the time limits established in the Project Schedule for each phase to relieve the Contractor of responsibility for liquidated damages.

**9.9 Partial Occupancy or Use****ADD THE FOLLOWING TO THE END OF SUBPARAGRAPH 9.9.1:**

If the Owner elects to occupy or use any completed or partially completed portion of the Work as permitted by Paragraph 9.9, the Contractor agrees to cooperate in the segregation and coordination of its construction activities. Such occupancy does not relieve the Contractor of liability to perform work required by the contract that has not been completed at the time of occupancy.

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**9.9.1.2** Prior to the foregoing occupancy activity beginning, it is essential that the following steps be taken by the Contractor:

- .1 Fire Escapes: Fire exits shall have the illuminated exit signs installed above the exit openings. Panic hardware shall be installed and fully operational. Required exits must be kept usable throughout the construction period. Provide lighted, enclosed walkways through construction areas and make other provisions for safety as required by governmental authorities having jurisdiction.
- .2 Building Security: Required door locks at doors are installed and operational.
- .3 Fire Protection Sprinkler System: The fire protection sprinkler system shall be completely operational.
- .4 Operation and Maintenance Manuals: Provide Operational and Maintenance manuals for equipment within the areas to be so occupied.

**9.10 Final Completion and Final Payment**

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**9.10.6** The Final Application for Payment will not be approved for payment by the Owner until the following Close-Out Documents are provided to the Owner by the Contractor in a "Close-Out Book" consisting of a black, three-ring binder with tabs for each category and any other Close-Out Document required by the specifications:

- .1 Final List of Subcontractors and Material Suppliers with their address, phone number and scope of work.
- .2 General Contractors Statement of one year Warranty.
- .3 Final Unconditional Lien Releases from General Contractor and all Subcontractors and Suppliers.
- .4 Final Inspection Approvals (See Specifications).
- .5 Red-Lined As-Built Drawings.
- .6 Electronic As-built files in pdf format on CD (2ea.), 1 set of prints in 30 inch x 42 inch format.
- .7 Any and all Operations Manual including but not limited to HVAC, Plumbing and Electrical.
- .8 All Building Permits
- .9 Consent of Surety
- .10 Signed receipts by Owner of attic stock.
- .11 All warranties and extended warranties required by Contract Documents for Contractor's work.
- .12 All maintenance service agreements.
- .13 Certified copy of Architect's Certificate of Substantial Completion.
- .14 Two copies of sign-in sheets and videos of owner training sessions.
- .15 Copy of weekly job photo documentation.
- .16 Two signed copies of certified interior area survey.

**9.10.7** In no instance will a final settlement be made upon the Contract until the expiration of thirty (30) days from the completion of the Contract.

**9.10.8** If "Close-Out" book is furnished later than 60 days from Substantial Completion, liquidated damages \$100 per day will be imposed for each day the "Close-Out Book" is late.

**ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY**

**10.1 Safety Precautions and Programs**

**ADD THE FOLLOWING SUBPARAGRAPHS:**

**10.1.1.1** All work performed in conjunction with this project will be done in full compliance with all current United States Occupational Safety and Health Administration (OSHA) regulations.

**10.1.1.2** Provide temporary bracing and shoring and protect work. Comply with State and local codes, and all U.S. Occupational Safety and Health Administration (OSHA) regulations.

Contractor is responsible for the performance of his temporary work. Protect work in progress and upon removal of temporary work, protect all surrounding existing work.

**10.2 Safety of Persons and Property****ADD THE FOLLOWING TO SUBPARAGRAPH 10.2.1:**

.4 Material and equipment provided by the Owner shall be received, stored, secured and protected in accordance with Paragraph 10.2.1.2 of the General Conditions. Incurred costs for receiving, storage, liability, and warranty labor shall be included in the Contract Amount. The Owner shall not be responsible for any contractor's material and equipment until Owners final acceptance as described in Paragraph 9.10.

**DELETE SUBPARAGRAPH 10.2.8 IN ITS ENTIRETY AND INSERT THE FOLLOWING:****10.2.8 Injury or Damage to Person or Property**

All accidents arising out of or in connection with the work which cause death, personal injury, or property damage are to be reported in writing immediately to the Owner and Architect.

These reports are to provide full detail of the incident, including any witness statements. All accident reports are to be submitted within one (1) calendar day. In addition, if death, serious personal injury or serious property damage should occur, report the accident immediately by telephone or messenger to the Owner or Architect.

**ARTICLE 11 - INSURANCE AND BONDS****11.1 Contractor's Insurance and Bonds****ADD CLAUSES TO SUBPARAGRAPH 11.1.1 AS FOLLOWS:**

The Contractor agrees to obtain, furnish and maintain in full force and effect without interruption during and throughout the entire term of the Agreement and for five (5) years thereafter, at its sole cost, all of the insurance required by and described in this Exhibit. All of said insurance shall be written by, and secured from, a responsible company or companies which are satisfactory to Owner and which are authorized to engage in such insurance business in the state where the work is being performed. Each policy of insurance shall be issued by insurers with a current AM Best's rating of A- IX or better. All of said insurance shall be written for not less than the limits specified herein, or as required by law, whichever is greater.

**11.1.1.1** Private entities performing Work at the site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project.

**11.1.1.2** The limits for Worker's Compensation insurance shall meet statutory limits mandated by State and Federal Laws. If (1) limits in excess of those required by statute are to be provided, (2) the employer is not statutorily bound to obtain such insurance coverage, or (3) additional coverages are required, additional coverages and limits for such insurance shall be as follows:

**11.1.1.3** The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all other default regarding the work by the Contractor, Subcontractor, or anyone directly or indirectly employed by the Contractor or Subcontractor or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

**11.1.1.4** Each of the insurance coverages required shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or qualified self-insured's or group self insured's, a specific excess insurer providing statutory limits) must have a Best Policyholders

Rating of "A-" or better and a financial size rating of Class V or larger.

**11.1.1.5** Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty (30) days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

**11.1.1.6** The Contractor shall procure the insurance in coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect. The Contractor shall furnish the Owner and insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for the final approval and execution of the Construction Contract. Failure to provide the proper Certificate of Insurance as required may result in the cancellation of the award of Contract. The insurance certificate must provide the following:

1. Name and address of authorized agent of the insurance company
2. Name and address of insured
3. Name and address of company or companies
4. Description of policies
5. Policy Number(s)
6. Policy Period(s)
7. Limits of Liability
8. Name and address of Owner as certificate holder
9. Project Name and Number, if any
10. Signature of authorized agent of the insurance company
11. Telephone number of authorized agent of the insurance company
12. Mandatory thirty (30) day notice of cancellation/non-renewal/change

**11.1.1.7** Self-insured retention (SIR) except for qualified self-insurers or group self-insurers, in any policy shall not exceed \$25,000.00 unless written permission is given by the Owner allowing higher SIR.

**11.1.1.8 Insurance Coverages**

**11.1.1.8.1 Worker's Compensation and Employer's Liability Coverage:**

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

- .2 Employer's Liability Insurance limits shall be at least:
- a. Bodily Injury by Accident - \$1,000,000 each accident
  - b. Bodily Injury by Disease - \$1,000,000 each employee

**11.1.1.8.2 Commercial General Liability Insurance:**

.1 Commercial General Liability Insurance ("CGL"), written on an ISO Occurrence Form, (current edition of ISO CG 00 01 as of the date of Advertisement of Bids) or equivalent, shall include but need not be limited to coverage for bodily injury and property damage arising from premises and operation liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at a minimum the following limits:

- |                        |                         |
|------------------------|-------------------------|
| a. Coverage            | Limit                   |
| (i) General Aggregate: | \$2,000,000 per Project |

- (ii) Products, Completed Operations Aggregate \$2,000,000 per Project
- (iii) Personal and Advertising Injury: \$1,000,000 per Occurrence
- (iv) Each Occurrence: \$1,000,000

2 Additional Requirements for Commercial General Liability Insurance:

- a. The policy shall name the Owner, City of Pell City, and the Architect, CMH Architects, Inc., and their consultants : Insite Engineering LLC, MBA Engineers, Inc., MW/Davis & Associates, Inc., and Professional Engineering Groups, Inc. The Certificate of Insurance shall list individually, the names of the City Manager, the Mayor, and all City Council Members as additional insureds (the Indemnitees), and state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents. Evidence that Contractor's insurance is primary with respect to any coverages available to the Indemnitees shall be provided in the form of an endorsement to Contractor's CGL policy. Evidence that the Indemnitees have been named as additional insureds shall be provided by endorsements equivalent to ISO CG 2010 or CG 2033 and CG 2037.
- b. The policy must include separate per project aggregate limits.

**11.1.1.8.3 Commercial Business Automobile Liability Insurance:**

- .1 Commercial Business Automobile Liability Insurance shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than \$1,000,000.00 Combined Single Limits for each occurrence.
- .2 The policy shall name the Owner, City of Pell City, and the Architect, CMH Architects, Inc., and their consultants : Insite Engineering LLC, MBA Engineers, Inc., MW/Davis & Associates, Inc., and Professional Engineering Groups, Inc. The Certificate of Insurance shall list individually, the names of the City Manager, the Mayor, and all City Council Members as additional insureds

**11.1.1.8.4 Commercial Umbrella or Commercial Excess Liability Insurance:**

- 1 Umbrella Liability Insurance shall provide coverage limits excess of the Commercial General Liability, Commercial Business Automobile Liability and the Employers' Liability coverage limits, on a follow-form basis, to satisfy the minimum limits set forth herein.
- 2 Minimum Combined Primary Commercial General Liability and Commercial Excess Umbrella limits of:
  - Excess Liability limits of:
    - i. \$5,000,000 per Occurrence
    - ii. \$5,000,000 Aggregate
- .3 The policy shall name the Owner, City of Pell City, and the Architect, CMH Architects, Inc., and their consultants: Insite Engineering LLC, MBA Engineers, Inc., MW/Davis & Associates, Inc., and Professional Engineering Groups, Inc. The Certificate of Insurance shall list individually, the names of the City Manager, the Mayor, and all City Council Members as additional insureds
- .4 The policy must be on an "occurrence" basis

**11.1.1.8.5 Builder's Risk Insurance:**

- .1 The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100 percent of the Contract Sum, written on a Causes of Loss- Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.
- .2 The policy shall be endorsed as follows:
  - a. The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:
    - i. Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or



- ii. Partial or complete occupancy by Owner; or
- iii. Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner.”

**11.1.1.8.6 Subcontractor's Insurance**

.1 Worker's Compensation and Employer's Liability Insurance. The Contractor shall require each Subcontractor to obtain and maintain statutory Workers' Compensation Insurance and adequate Employer's Liability Insurance covering all employees working on the jobsite.

.2 Liability Insurance. The Contractor shall require each Subcontractor to obtain and maintain adequate Commercial General Liability and Automobile Liability Insurance coverages equal to those of the General Contractor. Such coverages shall always be in effect that a Subcontractor is performing Work under the Contract.

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

**11.1.1.8.7 Termination of Obligation**

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

.1 Builder's Risk Insurance. The obligation to insure under Subparagraph 11.1.1.8.5 shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

.2 Products and Completed Operations. The obligation to carry Products and Completed Operations coverages specified for Commercial General Liability shall remain in effect for at least the time period established by applicable state law for bringing actions based on defective construction or design claims.

.3 All Other Insurance. The obligation to carry other insurance coverages specified above shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

**11.1.1.8.8 Waivers of Subrogation**

.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, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by builder's risk insurance or other property insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, suppliers, agents, and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of parties enumerated herein. The policies shall provide

such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall survive final acceptance and continue to insured losses to the Work or other property on or adjacent to the Project.

**11.1.1.9** The insurance required by Subparagraph 11.1.1 must be written for not less than the limits of liability stated, or greater if required by law. Additionally, the policy shall list individually, the names of the City Manager, the Mayor, and all City Council Members, the Architect, CMH Architects, Inc., and their Consultants: Insite Engineering LLC, MBA Engineers, Inc., MW/Davis & Associates, Inc., and Professional Engineering Groups, Inc. The Certificate of Insurance shall list, individually, the names of the City Administrator, all Pel City Council Members as additional insureds (the "Indemnitees"). Coverages required with thirty (30) day cancellation notice:

**11.1.1.10** The Contractor must furnish one copy each of Certificates of Insurance required for each copy of the Agreement which specifically sets forth evidence of all coverage required by Subparagraphs 11.1.1, and 11.1.3. Submit the certificate on AIA document G705, Certificate of Insurance. Furnish Owner and the Architect and Construction Manager copies of any endorsements subsequently issued amending coverage limits.

**11.1.1.11** The insurance required by Section 11.1 is not intended to cover machinery, tools or equipment owned or rented by the Contractor that 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.

**11.1.1.12** The Contractor shall, at the Contractor's own expense provide insurance coverage for materials stored off the site after written approval of the Owner at the value established in the approval, and also for portions of the Work in transit until such materials are permanently attached to the Work.

.1 The Contractor shall be responsible for securing Certificates of Insurances from all Subcontractors.

**DELETE SUBPARAGRAPH 11.1.2 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING**

**11.1.2** The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to one hundred percent (100%) of the Contract Sum. Payment and Performance Bond shall be issued by an entity that:

- i) has a Rating of A- or better;
- ii) is in a "Financial Size Category" of at least VII (\$50 to \$100 million); and
- iii) has an "Outlook" of either "Positive" or "Stable."

**ADD THE FOLLOWING CLAUSES TO SUBPARAGRAPH 11.1.2**

**11.1.2.1** The Contractor shall deliver the required bonds to the Owner not later than fourteen (14) days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

**11.1.2.2** The Contractor shall require the attorney-in-fact, who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

**ADD NEW SUBPARAGRAPH 11.1.5 AS FOLLOWS:**

**11.1.5** The Contractor must assume all liability for an indemnify and save harmless the Owner, Architect, and their consultants and employees from all damages and liability for injury or death to any person and their consultants and employees from all damages and liability for injury or death to any persons, and injury to or destruction of property, including the loss of use thereof,

by reason of an accident or occurrence arising from operations under the contract, whether such operations be by himself, any Subcontractor, or any one directly or indirectly employed by either of them, occurring on or about the premises or the ways and means immediately adjacent, during the term of the contract, or any extension thereof, and must also assume the liability for injury and/or damages to adjacent or neighboring property by reason of work done under this contract. The obligations of the Contractor under this paragraph will not extend to the liability of the Architect, their agents, or employees arising out of the preparation or approval of maps, drawings, reports, surveys, Change Orders, design or specifications. However, neither the Owner, Architect, their agents, or employees have any responsibility to give any advice, instruction, suggestion or recommendation concerning any safety policy, procedure, or practice of the Contractor, to require correction of any unsafe condition, or to prevent or to attempt to prevent injury or damage to any person or property, and failure to do so will not constitute any breach of their individual or collective duties, responsibilities or obligations under the Contract. All such matters are and remain the sole responsibility of each Contractor.

## **ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK**

### **12.2 Correction of Work**

#### **ADD THE FOLLOWING SUBPARAGRAPH TO SUBPARAGRAPH 12.2.2:**

**12.2.2.4** Upon request by the Owner and prior to the expiration of one year warranty period from the date of Substantial Completion, the Architect will conduct, and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

## **ARTICLE 13 - MISCELLANEOUS PROVISIONS**

### **13.2 Successors and Assigns**

#### **ADD THE FOLLOWING SUBPARAGRAPH:**

**13.2.1** Owner shall have the right to assign the contract without the Contractor's consent, provided, however, if Owner does so assign the Contract without Contractor's consent, Owner will not be relieved of its obligations under the Contract.

The Contractor will consent to an assignment of this Contract to the Lender, as security.

### **13.4 Tests and Inspections**

#### **DELETE SUBPARAGRAPH 13.4.1 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

**13.4.1** Construction testing shall be performed by an independent testing laboratory selected and paid for by the Owner. Preparation of pavement mix designs is the responsibility of the Contractor and is not part of the testing services to be paid for by the Owner. The Contractor shall coordinate scheduling for construction testing and shall also provide reasonable assistance needed by the testing laboratory to insure that the proper testing procedures are followed. Failure to notify the testing laboratory prior to installation will result in the Contractor repairing or replacing such work until proper testing procedures are met. The independent testing laboratory shall prepare certified test reports that indicate the type, location, date time, conditions, and results of each test. The Owner, Contractor and Tenant (if applicable) shall be provided with copies of each test report within 48 hours of the time the test was performed. In the event a test fails to comply with Drawings and Specifications, Owner and Contractor shall be notified immediately by the testing laboratory.

#### **ADD NEW PARAGRAPH 13.7 Harmony Clause AS FOLLOWS:**

### **13.7 Harmony Clause**

**13.7.1** The Contractor and all Subcontractors agree that no labor dispute of any kind involving any Contractor or Subcontractor, or their employees or agents shall be permitted to occur or be manifested on the Project and the Contractor and Subcontractors to that end to only employ persons on the Work who will work at all times in harmony with other persons employed of the Project.

**13.7.2** The Contractor and all Subcontractors agree and their employees shall not participate in or accede to any work stoppage, slow down or any type of interference with the performance of work by other persons on the project which may occur as a result of any labor dispute involving their employees.

**13.7.3** Should there be a work stoppage, slow down or any type of interference with the performance of work by other persons on the project involving the Contractor or his employees or a Subcontractor or his employees resulting from a labor dispute and which in the judgment of the Owner will cause, or threatens to cause delay in the progress of construction, then upon twenty-four (24) hours written notice, Owner shall have the right to declare the Contractor and/or Subcontractor in default under this Contract and take such steps as are necessary to finish the uncompleted portion of work. In such event Owner shall have the right to take possession of and use all of the Contractor's and/or Subcontractor's materials (exclusive of tools) intended for use on the Work. The cost of completion including all expenses, attorney's fees and costs incurred in resolving the labor dispute shall be charged against the Contractor and/or Subcontractor's remaining interest in the Contract amount.

**13.7.4** Should the Contractor and/or Subcontractor(s) become involved in a labor dispute resulting in a work stoppage, slow down or any type of interference with the progress of construction and resulting in an increase in interest charges to Owner, the Contractor and/or Subcontractor(s) shall be liable to Owner for this increased cost. If the Contractor and/or Subcontractor's agree to pay Owner such excess within thirty (30) days after written demand for such excess has been made upon him by Owner.

**13.7.5** Should the Contractor and/or Subcontractor(s) become involved in a contractual dispute resulting in a lien being placed on the project work stoppage, slow down, or any type of interference with the progress of construction and in the judgment of the Owner will cause, or threatens to cause delay in the progress of construction, then upon twenty-four (24) hours written notice, Owner shall have the right to take possession of and use all of the Contractor and/or Subcontractor's material (exclusive of tools) intended for use on the project. The cost of completion, including all expenses, attorney's fees and costs incurred in resolving subject disputes shall be charged against the Contractor and/or Subcontractor's remaining interest in the Contract amount.

**13.7.6** Harmony clause provisions similar to the provisions of the immediately preceding paragraphs shall be included in any of the Contractor and/or Subcontractor's subcontracts relating to the Work.

**ADD NEW PARAGRAPH 13.8 Liquidated Damages AS FOLLOWS:**

**13.8 Liquidated Damages**

**13.8.1** Should the Contractor or, in case of default, the surety fail to complete the work within the contractual time frame and no extension of contract time is granted by the Owner, a deduction for each calendar day that any work shall remain incomplete, an amount shall be deducted from any monies due to the Contractor. Liquidated damages assessed provided in the specifications is not a penalty but is intended to compensate the Owner for increased time in administering the contract, supervision, inspection and engineering which required the Owner's forces for a longer time on any construction operation or phase than originally contemplated when the contract period was agreed upon in the contract. Permitting the Contractor to continue and finish the work or any part of it after the contractual completion date will in no way waive the Owner's rights under the contract.

**13.8.2** Therefore, should Contractor fail to obtain Substantial Completion by the date agreed to in the contract, the Contractor shall pay the Owner the sum of one thousand dollars (\$1,000) for each day beyond that date until Substantial Completion is obtained. Further, a time charge equal to \$200.00 dollars per calendar day will be assessed against the final payment for each additional day required beyond sixty days from the date of Substantial Completion to submit final Close-Out documents.

**ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT**

**14.2 Termination by the Owner for Cause****ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 14.2.1:**

- .5 Fails to provide proper supervision or displays inability to complete the work as scheduled.
- .6 Refuses to correct defective work after notification.

**14.4 Termination by the Owner for Convenience****DELETE PARAGRAPH 14.4 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:****14.4 Termination by the Owner for Convenience**

**14.4.1** The Owner reserves the right to terminate the Contract for convenience and without cause even though the Contractor has not failed to perform any part of the Contract. Termination of the Work hereunder shall be affected by written notice to the Contractor. Upon receipt of such notice, the Contractor shall, unless the notice otherwise directs,

- .1 Immediately discontinue the work and the placing of all orders and subcontracts in connection with this Contract.
- .2 Immediately cancel all of the existing orders and subcontracts made hereunder; or at Owner's option, assign to Owner all or part of such existing orders and subcontracts;
- .3 Immediately transfer to the Owner all materials, supplies, Work in progress, appliances, facilities, machinery, and tools acquired by the Contractor in connection with the performance of the Contract, and take such action as may be necessary or as the Owner may direct for protection and preservation of the Work relating to this Contract; and
- .4 Deliver all plans, drawings, specifications, and other necessary information to the Owner.

**14.4.2** If the Owner terminates the Contract for convenience, the following shall be the Contractor's exclusive remedies:

- .1 Reimbursement of all actual expenditures and costs approved by the Owner as having been made or incurred in performing the Work;
- .2 Reimbursement of expenditures made and costs incurred with the Owner's prior written approval in settlement or discharging outstanding commitments entered into by the Contractor in performing the Contract, and
- .3 Payment of profit, insofar as profit is realized hereunder, of an amount equal to the estimated profit on the entire Contract at the time of termination multiplied by the percentage of completion of the Work. In no event shall the Contractor be entitled to anticipated fees or profits on work not required to be performed.

**14.4.3** All obligations of the Contractor under the Contract with respect to completed Work, including but not limited to all warranties, guaranties, and indemnities, shall apply to all Work completed or substantially completed by the Contractor prior to a convenience termination by the Owner. Notwithstanding the above, any convenience termination by the Owner or payments to the Contractor shall be without prejudice to any claims or legal remedies that the Owner may have against the Contractor for any cause.

**14.4.4** Upon a determination that a termination of this Contract other than a termination for convenience under this Article was wrongful or improper for any reason, such termination shall automatically be deemed converted to a convenience termination under this Article, and the Contractor's remedy for such wrongful termination shall be limited to the recoveries specified under Subparagraph 14.4.2 of this Article.

**ARTICLE 15 – CLAIMS AND DISPUTES****15.1 Claims****MODIFY SUBPARAGRAPH 15.1.3 .1 AS FOLLOWS:**

**REPLACE** both references to "21 days" in the next to last line of the Subparagraph with the words "7 (seven) days".

**ADD THE FOLLOWING SUBPARAGRAPHS TO SUBPARAGRAPH 15.1.6.2:**

**15.1.6.2.1** Calculation of rain days shall be determined as follows:

- .1 Obtain precipitation data from the National Oceanic and Atmospheric Administration (N.O.A.A.) for Project Site or nearest NOAA Location
- .2 A rain day is considered to be any day with a measured precipitation of more than 0.1 inch.
- .3 Determine the average number of days per month with a measured precipitation of more than 0.1 inch for the five-year period preceding the start of the project in question.
- .4 Compare the number of rain days during each month of the project contact time period to the monthly five-year average. The Contractor may be granted an extension for rain days during the contract period which exceeded the five-year average. The number of days granted will vary for different types of projects, depending upon the amount of inside or outside work. Refer to the following table for various time extensions pertinent to typical project types. No time will be deducted from the contract period for months when rain days are less than the five-year average.

<b>Class</b>	<b>Type of Project</b>	<b>Number of Days Granted Per Each Rain Day Beyond the Five-Year Average</b>
<b>I</b>	<b>Low slope (1:12 or less) roof re- placement on existing building</b>	<b>2/each</b>
<b>II</b>	<b>Sitework, paving, underground utilities</b>	<b>3/each</b>
<b>III</b>	<b>New Building, Building Demolition and steep roof replacement (greater than 1:12)</b>	<b>1/each</b>
<b>IV</b>	<b>Renovation of existing building with some outside work</b>	<b>.5/each</b>
<b>V</b>	<b>Renovation of existing building with no outside work</b>	<b>0</b>

- .5 If time extensions are granted, they shall be included in the next subsequent change order.

.6 if granted, time extension will be based on Rain Day Class II or III from the above Table unless otherwise modified by Contract Documents.

.7 Reporting of rain days shall be included in each monthly schedule update along with any request for extension of the Contract Time, if additional days are not requested for rain days at the end of the month, the Contractor forfeits the right to request those days later.

**ADD THE FOLLOWING SUBPARAGRAPHS.**

**15.1.6.3** Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Architect may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

**15.1.6.4** The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

**15.1.6.5** Inclement or adverse weather shall not be a prima facie reason for the granting of an extension of time, and the Contractor shall make every effort to continue work under prevailing conditions. The Owner may grant an extension of time if an unavoidable delay occurs as a result of inclement/severe/adverse weather, and such shall then be classified as a "Delay Day". Any and all delay days/rain days granted by the Owner are and shall be non-compensable in any manner or form. The Contractor shall comply with the notice requirements concerning instances of inclement/severe/adverse weather before the Owner shall consider a time extension. Each day of inclement/severe/adverse weather shall be considered a separate instance or event and as such, shall be subject to the notice requirement of Section 15.1.2.

**15.2 Initial Decisions**

**DELETE SUBPARAGRAPH 15.2.1 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:**

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

**ADD ARTICLE 16 APPLICABLE PUBLICATIONS (SUPPLEMENTARY) AS FOLLOWS:**

**ARTICLE 16 APPLICABLE PUBLICATIONS (SUPPLEMENTARY)**

**16.1 Reference**

**16.1.1** Any reference to a publication by its basic designation shall be a reference to the issue, edition and amendment (if any) of that publication current on the date of these specifications. That publication shall form a part of these specifications to the extent indicated by the reference thereof.

**16.2 Abbreviations**

**16.2.1** Abbreviation used refers to the following basic publications: ACI, American Concrete Inst.; AIA, American Inst. of Architects; AISC, American Inst. of Steel Const.; ASHRAE, American Society of Heating, Refrigeration and Air Conditioning Engineers; ASTM, American Society for Testing and Materials; CRSI, Concrete Reinforcing Steel Inst.; Fed. Spec. (FD), Federal Specifications; SJI, Steel Joist Inst.; CS, U.S. Dept. Of Commerce Commercial Standards; and ANSI, American National Standards Inst.

**ADD ARTICLE 17 GUARANTEE (SUPPLEMENTARY) AS FOLLOWS:****ARTICLE 17 GUARANTEE (SUPPLEMENTARY)**

**17.1** The General Contractor shall guarantee the Work performed under the Contract Documents from any defects due to materials or workmanship, and for necessary adjustments to mechanical systems for a period of one year from date of Owner's Final Acceptance of the Work. The General Contractor shall cut out and replace any defective work, materials or equipment, at his own expense, that occur during the year following acceptance of the work.

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



**SECTION 01 1000  
SUMMARY****PART 1 GENERAL****1.01 PROJECT**

- A. Project Name: Pell City Fire Station #2
- B. Owner's Name: City of Pell City.
- C. Architect's Name: CMH Architects, Inc..
- D. The Project consists of the construction of Fire Station #2.

**1.02 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

**1.03 DESCRIPTION OF WORK**

- A. Summary of the Work - NEW FIRE STATION #2 is a ±16,665 SF facility that will replace the City's existing Station #2 on a different site. There will be 4 vehicle bays that each accommodate two apparatus units in series. The building is constructed of loadbearing 12 inch reinforced CMU walls for the TRUCK BAY & STORM SHELTER portion of the BUILDING and non-loadbearing 8 inch CMU walls for the OFFICE / RESIDENTIAL side of the BUILDING. The EXTERIOR of the building will be constructed of masonry veneer cavity wall construction with natural STONE and modular brick veneer and with precast accents. THE ROOF system will be STANDING SEAM METAL on METAL DECK ON PREFABRICATED METAL TRUSSES. The FLOOR SYSTEM is a reinforced CONCRETE SLAB on GRADE with a sealed finish in the TRUCK BAY & ADJACENT PPE/ DECONTAMINATION AREA side and a STAINED/ POLISHED finish in the RESIDENTIAL SIDE except for limited areas of CERAMIC or PORCELAIN TILE in the RESTROOMS. THIS BUILDING is EQUIPPED with a full fire SPRINKLER SYSTEM, ICC-500 compliant storm shelter, and a NATURAL GAS POWERED BACK-UP GENERATOR for EMERGENCY POWER. The site will include extensive grading, heavy duty paving around the building, public and staff parking areas, and a new emergency traffic light onto Highway 231 (Martin Street).
- B. Plumbing: Complete functional system.
- C. HVAC: Complete functional system.
- D. Electrical Power and Lighting: Complete functional system with back up generator.
- E. Fire Suppression Sprinklers: Complete functional system.
- F. Fire Alarm: Complete functional system.

**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.
  - 2. Note Jurisdictional Evaluation Report.
- B. 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.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 2000  
PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

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

**1.02 RELATED REQUIREMENTS**

- A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.
- B. Section 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- C. Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- D. Section 01 7800 - Closeout Submittals: Requirements for Closeout Submittals
- E. Section 017810 - Project Record Submittals: Specific requirement for the Project Record Documents.

**1.03 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. Round amounts to the nearest whole dollar; total shall equal the Contract Sum.
- E. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- F. 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.
- G. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- H. Provide separate line items in the Schedule of Values for initial costs of materials, for each subsequent stage of completion, and for total installed value of that portion of the Work.
- I. Include in each line item, the amount of Allowances specified in this section.
- J. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- K. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.04 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. Notarize and 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 one electronic and three signed and notarized hard-copies of each Application for Payment.
- J. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirement outlined in this section.
- K. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of Subcontractors
  2. Schedule of Values
  3. Contractor's Construction Schedule (Preliminary if not final)
  4. List of Contractor's staff assignments
  5. List of Contractor's principal consultants
  6. Submittal Schedule (preliminary if not final)
  7. Copies of building permits
  8. Copies of authorization and licenses required from authorities having jurisdiction for p
  9. Initial Progress report
  10. Report of the Preconstruction Conference.
  11. Certificates of Insurance and Insurance Policies
- L. Include the following with the application:
1. Transmittal letter as specified for submittals in Section 01 3000.
  2. Construction progress schedule, revised and current as specified in Section 01 3216.
  3. Partial release of liens from major subcontractors and vendors.
  4. Project red lines as-builts as required current available for review at site visit by Architect just prior to the submittal of the Application for Payment.
  5. Proof of Insurance and photographic documentation for any claim on the application for material stored off-site.
  6. 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.
- M. Application of Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued perviously for Owner occupancy of designated portions of the Work.

- N. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid by the Owner.
- O. Payment Application Times: Progress payment shall be submitted to the Architect by the 25th of the month unless Agreement defines a different submittal date. The period covered by each Application for Payment is one month ending on the last day of the month.
- P. Application Preparation: Complete every entry on the form. Notarize and execute by a person authorized to sign legal documents on behalf of the Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Change Orders, Allowance Adjustments and Construction Change Directives approved before last day of construction period covered by the Application.
- Q. Waiver's of Mechanics Lien: With each application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for the amount requested in the previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Waivers shall be submitted on the forms provided in this specification.

#### **1.05 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 15 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 6000.
- 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 change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
  - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
  - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for

Time and Material work.

- G. Substantiation of Costs: Provide full information required for evaluation.
  - 1. On request, 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.

#### **1.06 APPLICATION FOR FINAL PAYMENT**

- A. Final Application for Payment: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to the following:
  - 1. Evidence of completion of Project closeout requirements, including all closeout submittals and Project Record Documents required for the project.
  - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations have been paid.
  - 3. Updated final statement, accounting for final changes to the Contract Sum.
  - 4. Final Waiver of Liens from all Subcontractors and Suppliers required by Owner.
  - 5. AIA Document G707 -Consent of Surety to Final Payment.
  - 6. Evidence that any outstanding claims have been settled.
  - 7. Final, liquidated damages settlement statement, if applicable.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 2300  
ALTERNATES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Price and Contract Time.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.
- B. Document 00 4100 - Bid Form.
- C. Document 00 5200 - Agreement Form: Incorporating monetary value of accepted Alternates.

**1.03 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.

**1.04 SCHEDULE OF ALTERNATES**

- A. Alternate No. One - Fixture Change in Room No. 140 and Decon Room No. 141:
  - 1. Base Bid Item: Provide FGA Fixtures in P.P.E. Room and Decon Room No. 141 as shown on Drawings.
  - 2. Alternate Item: Provide FGB Fixtures in lieu of FGA Fixtures in P.P.E. Room No 140 and Decon Room No. 141

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

**SECTION 01 2500  
SUBSTITUTION PROCEDURES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

**1.02 DEFINITIONS**

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by the Contractor.

**1.03 RELATED REQUIREMENTS**

- A. Section 002114 - Supplemental Instructions to Bidders: Restrictions on timing of substitution requests during bidding.
- B. Section 00 4325 - Substitution Request Form - During Bidding/Negotiation: Required form for substitution requests made prior to award of contract (During procurement).
- C. Section 00 6325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- D. Section 007300 - Supplemental General Conditions: Restrictions and requirements for substitutions during construction.
- E. Section 01 2300 - Alternates, for product alternatives affecting this section.
- F. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- G. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

**1.04 DEFINITIONS**

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to methods, materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
    - a. Substitution requests offering advantages solely to the Contractor will not be considered.

**1.05 REFERENCE STANDARDS**

- A. AIA A701 - Instructions to Bidders; Current Edition.
- B. AIA A201 - General Conditions of the Contract for Construction; Current Edition.

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

- A. A Substitution Request for methods, 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 the substitution requests including designs costs that become apparent subsequent with the approval.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
  1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. 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.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
  1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- E. 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 and Supplemental Instructions to Bidders specify requirements, time restrictions and the documents required for submitting substitution requests during the bidding period.
- B. Submittal Form (during Bidding/Negotiation):
  1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

### 3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
  1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for Substitutions for Convenience only within 30 days after date of the Notice to Proceed.
- C. Submit request for Substitution for Cause immediately upon 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.
- D. Include the following in any request for Substitution for Cause:
  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.
    - b. Other construction by Owner.
    - c. Other unanticipated project considerations discovered subsequent to approval of any Substitution.
- E. 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.

**3.04 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 7800 - 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**

**SECTION 01 3000  
ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Coordination drawings.
- C. Submittals for review, information, and project closeout.
- D. Number of copies of submittals.
- E. Requests for Information (RFI) procedures.
- F. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 5000 - Contacting Form and Supplements: General Conditions: Dates for applications for payment.
- B. Section 00 7300 - Supplementary Conditions.
- C. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
- D. Section 01 6000 - Product Requirements: General product requirements.
- E. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- F. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

**1.03 GENERAL ADMINISTRATIVE REQUIREMENTS**

- A. Comply with requirements of Section 01 7000 - 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 Information (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.

**1.04 MISCELLANEOUS REQUIREMENTS**

- A. Brand Names: Submit for review a list of brand name materials proposed for use under any Section before any work under that Section is begun.
- B. Progress Schedule: Submit per AIA A201 General Conditions of the Contract for Construction , Section 00 7300 - Supplemental Conditions, and Section 01 3216 - Construction Progress Schedule.
- C. Schedule of Values: Submit on AIA Document G703 Continuation Sheet. Furnish additional breakdowns when requested by the Architect or Owner.
- D. Closeout Submittals: See Section 01 7800 - Closeout Submittals
- E. List of Subcontractors: Submit for approval as indicated in General Conditions.

F. Evidence of Insurance: Submit as indicated in Supplementary General Conditions.

## **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 and Architect.
  - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.02 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- D. 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. Review of RFIs log and status of responses.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### 3.03 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. 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.
- F. 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.
  - 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- G. 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. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
  - 4. 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.
  - 5. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

### 3.04 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
  - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
  - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. 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.
- C. 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 Owner.
    - a. Use Architect's Form included in this Specification.
  3. Prepare using an electronic version of the form included in this specification.
  4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. 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 6000 - 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, with an explanatory notation.
  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.
    - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. 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.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. 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.
  5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within seven 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.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. 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.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
  3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.05 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 3216 - Construction Progress Schedule.
  2. Coordinate with Contractor's construction schedule and schedule of values.
  3. Format schedule to allow tracking of status of submittals throughout duration of construction.
  4. 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.
  5. 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.

### **3.06 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

- A. Architect's preferred method for processing submittals is by Newforma. Access to the Architect's hosted system will be provided to the Contractor for his use in submitting and monitoring submittals. Alternatively, the Contractor may submit by email and track the submittals manually.
- B. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by the Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of the digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of the digital data drawings files as they relate to the Contract Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of the Architects Digital Licensing Agreement, a copy of which is included in this manual.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination with other submittals until related submittals are received.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows:
1. Time for review shall commence on Architect's receipt of the submittal. No extension of the Contract Time shall be authorized due to failure to transmit submittals to the Architect enough in advance of the Work to permit processing, including resubmittals if necessary.
    - a. Initial Review: Allow ten (10) working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination with submittal that have not been received.
    - b. Resubmittal Review: Allow ten (10) working days for review of each resubmittal.
    - c. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner or other parties is indicated, allow fifteen (15) working days for initial review of each submittal.
- E. Options: Clearly identify options requiring selections by Architect.
- F. Electronic Submittals:
1. Submittals shall be submitted electronically unless they are physical samples. Electronic submittals shall be submitted either as email attachments or using the Architect's FTP site and logged in with the host software of that site (Newforma).
    - a. Email Submittals shall be identified in the subject line with the project name, submittal number and information being submitted... The Submittal number shall include the relevant specification section followed by a suffix with the submittal number: For example:
      - 1) Product 01 3000.01 - Product name or description to match submittal schedule.
      - 2) Product 01 3000.01-01 - Resubmittal - Product Name or description to match submittal schedule.
    - b. FTP Submittals shall be similarly identified but information may be filled into the popup menu provided on the site.
    - c. Do not submit more than one submittal per email or combine submittals requested in separate specification sections into one submittal. Email or upload each submittal separately.
    - d. Submittals must be submitted through the Contractor, submittals from a Subcontractor or Supplier will not be reviewed.
  2. Format:
    - a. It is the Contractor's responsibility to provide submittals in .pdf format. The Contractor may use the following options.
      - 1) Subcontractors and suppliers provide electronic submittals in .pdf format to the Contractor.
      - 2) Subcontractors and Suppliers provide paper submittals to the Contractor, who electronically scans and converts them to .pdf format.
      - 3) Contract a Scanning Service, which will allow the Contractor along with his/her Subcontractors and Suppliers to provide paper copies of submittals to the Scanning Service, which electronically scans and converts the submittals to .pdf format; however, it is the Contractor's responsibility to transmit or upload the files to the Architect, files from a third party will not be accepted.
  3. Image Quality:
    - a. Image resolution for .pdf format files shall be a minimum of 200 dots per inch utilizing the original document size. The Contractor will be responsible to increase the resolution of the scanned file or images being submitted as required to adequately present the information.
    - b. When the information being submitted requires color to convey the intent and compliance with the Contract documents, provide full color .pdf format file.
  4. Internet Service and Equipment Requirements:



- a. The Contractor will be required to have an email address and Internet access at the Contractor's main office and the field office.
  - b. The Contractor will be required to own a .pdf reviewing, creating and editing software, such as Adobe Acrobat (www.adobe.com), Bluebeam .pdf Revu (www.bluebeam.com), or other similar .pdf reviewing, creating, and editing software form applying electronic stamps and comments.
5. Options: Identify options requiring selection by Architect.
  6. Deviations: Deviations in product supplier or significant product selection are Substitutions and shall be submitted as such. Deviations submittal as Submittals are subject to being rejected.
  7. Resubmittals: Make resubmittals in the same form and number of copies as initial submittal.
    - a. Note date and content of previous submittal
    - b. Note date and content of revision in label or title block and clearly indicate extent of revision.
    - c. Resubmit submittals until they are marked with approval notation from the Architect's or Engineer's action stamp.
  8. Distribution: Contractor shall be responsible for furnishing copies of final approved submittals to manufacturers, subcontractor's, suppliers, fabricators, installers, authorities having jurisdiction as required, and others as necessary for performance of the Work.
  9. Use for Construction: Retain complete copies of submittals on Project Site.. Use only final action submittals that are marked with approval notation from Architect or Engineer.

### **3.07 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
  1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for 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 7800 - Closeout Submittals.

### **3.08 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  1. Design data.
  2. Certificates.
  3. Test reports.
  4. Inspection reports.
  5. Manufacturer's instructions.
  6. Manufacturer's field reports.
  7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.
- C. Submittals for Information will not be reviewed and returned, unless there is an objection to information contained otherwise these types of submittals will be marked "For Record Only" and will be placed in the project file.

### **3.09 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.

- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - 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.

### 3.10 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.

### 3.11 SUBMITTAL PROCEDURES

- A. General Requirements:
  - 1. Submit for review as required in individual specification sections, but only after affixing signature of approval thereof; otherwise material will be returned disapproved. Contractor's approval stamp must be present that the submittal complies with requirements of the Contract Documents, and has been checked and coordinated with all parts of the Work. Revise and resubmit until Architect's or Engineer's approval is secured.
  - 2. Architect and/or Engineer will review submittals for design intent only, and assumes no responsibility for dimensions, quantities or erection procedures indicated in the submittal.
  - 3. Contractor is responsible to note specifically any deviations from the Contract Documents in the submittal prior to sending the submittal to the Architect for review. The Architect's and/or Engineer's approval of a submittal is not an approval of a deviation unless such deviation was specifically noted in the letter or transmittal and marked within the submittal and the deviation is expressly approved by written note with the approved submittal.
  - 4. Approval of a specific item does not constitute approval of an assembly in which the item is a part. Submit data on all related items within an assembly simultaneously to facilitate a logical review of all items in that assembly together.
  - 5. A copy of each submittal bearing the Architect's and/or Engineer's approval shall be kept at the field office and shall be maintained in good condition. No submittal other than those with an approval shall be on the jobsite for any purpose.
  - 6. Submittals must be submitted through the Contractor directly to the Architect in electronic format or physical samples, submittals sent to Architect directly from Subcontractors or supplier will be returned unreviewed.
  - 7. Action Submittals: Architect will return the file electronically to the Contractor annotated with the review, and retain an electronic copy as a record. Contractor is responsible for distribution of the submittals to Subcontractors and suppliers.
  - 8. Informational Submittals: Architect will not return the submittal but will retain as a record.
  - 9. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of the entity.
    - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications.
    - b. Provide a notarized statement on original paper copy certificates and certifications submitted as physical documents.
- B. Product Data: Collect information into a single submittal for each element of construction and type of equipment.

1. If information must be prepared specifically for the project, because standard published data is not suitable, submit as a Shop Drawing not as Product Data.
  2. Mark Product Data to indicated the specific products and options are applicable to the project.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cut sheets.
    - b. Manufacturer's Product specifications
    - c. Standard color charts for initial selection.
    - d. Statement of compliance with specified reference standards.
    - e. Testing by a recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Installation instructions including coordination required with adjacent products.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to above, as applicable:
    - a. Wiring Diagrams showing factory installed wiring of components.
    - b. Printed performance curves
    - c. Operational range diagrams
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Date electronically in .pdf format.
- C. Shop Drawings: Prepare shop drawings with project specific information drawn accurately to scale. Shop drawings based on Architect provided digital files require the preparer to base critical dimensions and clearance on verified dimensions in the field and cannot rely on the Architect's digital file for those dimensions.
1. Preparation: Fully illustrate compliance with requirements of the Contract Documents. Include the following information as applicable:
    - a. Identification of products being proposed
    - b. Schedules for materials and products
    - c. Compliance with specified standards
    - d. Notation of any coordination requirements with other trades.
    - e. Notation of dimensions established by field verification or critical dimensions that must be held in the field.
    - f. Attachments and integration with adjoining construction.
    - g. Seal and signature of Professional Engineer, registered in State where project is located, when required.
  2. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches, but no larger than 30 x 42 inches.
  3. Submit drawings electronically in .pdf 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. All samples required by the Contract Documents **must be submitted as physical samples**.
1. Where required, submit three of each item clearly labeled as to the manufacturer and job along with identifiers as to color, texture etc. Architect will retain one for record and return others to Contractor, one of which shall be kept on-site for comparison purposes. The Architect may procure test samples randomly from stock on-site for comparison to the approved sample. Material not matching the approved samples will be removed from the project including any material already in place at the Contractor's sole expense.
  2. Samples for Initial Selection: Unless colors and patterns are specified in the Contract Documents provide three (3) full set of samples for the finishes available from which the Architect can make initial selections. The samples for initial selections shall be submitted well before the first selection is needed (no later than 30 days after award).

- a. Initial Selections will not be made until samples are available for selection of all the materials.
- b. All samples for color selection shall be physical samples. **Printed or electronic representations are not acceptable.**
- c. Architect will return two sets and retain one with the initial selections.
3. Transmit Samples and physical samples of the accessories together in one submittal package.
4. Attach label on the unexposed side of sample that includes the following information.
  - a. Project name and Architect's project number.
  - b. Number and title of the applicable Specification Section.
  - c. Generic description of the sample.
  - d. Product name and the name of the manufacturer.
  - e. Sample source.
5. Provide a corresponding electronic submittal, digital image file of sample illustrating sample characteristics, and identification information for record.
6. Disposition: Maintain one set of approved samples at the project site, available for quality control comparisons throughout the course of construction activity. Sample set may be used to determine final acceptance of construction associated with the sample.
  - a. Unless specifically noted otherwise by the Specifications, samples are not to be incorporated into the work, and are the property of the Contractor.
- E. Contractor's Construction Schedule: Comply with requirements specified in Section 01 3216 - Construction Progress Schedule.
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 2000 - Price and Payment Procedures.
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with Requirements specified in Section 01 4000 - Quality Requirements
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7000 - Execution and Closeout Requirements.
- I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include list of completed projects with project names and addresses, contact information or Architects and Owners, and other information specified.
- J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements of the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required is authorized by manufacturer for this specific project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that the product complies with the requirements of the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements of the Contract Documents.
- O. 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.
- P. Product Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating that current product produced by the manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by

manufacture and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- Q. Research Reports: Submit written evidence, from a model code organization acceptable to the authorities having jurisdiction, that product complies with building code in effect for Project.
- R. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 4000 - Quality Requirements.
- S. 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 the product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by qualified testing agency, on agency's standard form, indicating and interpreting results of compatibility tests performed before installation of the product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of the product or after installation of the product or assembly in its final location, for compliance with requirements of the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to the following:
  - 1. Performance and design criteria
  - 2. List of applicable codes and regulations
  - 3. Calculations
    - a. Include a list of assumptions and other performance and design criteria and a summary of loads, along with load diagrams if applicable.
    - b. Provide name and version of the software, if any, used in preparation of the calculations with page numbers notated.

### 3.12 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of the Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed .pdf electronic file and seven (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### 3.13 SUBMITTAL REVIEW - CONTRACTOR

- 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 Architect.
  - 1. Submittals that have not been reviewed by the Contractor will be return without action,, and notated that Contractor has not reviewed.
- B. Project Closeout and Maintenance Material Submittals: See requirements of Section 01 7800 - Closeout Submittals.
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include project name and location, submittal number, Specification Section title and number, name of reviewer, date of the Contractor's approval, and statement certifying that the submittal has been reviewed,

checked and approved for compliance with the Contract Documents.

**3.14 SUBMITTAL REVIEW - ARCHITECT'S ACTION**

- A. Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each Submittal, and make marks to indicate corrections or revisions required, and return the submittal to the Contractor. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

**SUBMITTAL REVIEW**

This review is solely for general conformance with the design concept of the Project and the information given in the Contract Documents. The Architect's review does not relieve the Contractor of responsibility for deviations from or substitutions to the Contract Documents, or errors and omissions in the Submittal. See General Conditions. For submittals previously reviewed by the Consultants, the Architect's review is limited to specific items requesting verification by the Architect and/or other items explicitly noted by the Architect. The Contractor is responsible for dimensions to be confirmed and correlated at the job site.

<b>NO EXCEPTIONS TAKEN</b>	<b>MAKE CORRECTIONS NOTED</b>
<b>REVISED AND RESUBMIT</b>	<b>REJECTED</b>
<b>NOT REVIEWED FOR FILE ONLY</b>	<b>NOT REVIEWED SUBMITTAL NOT REQUIRED</b>
BY: _____	Date: _____
<b>NOTES/COMMENTS:</b>	

- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements of the Contract Documents. Architect will return to the Contractor for distribution to appropriate subcontractors and vendors.
- D. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without action for resubmittal.
- E. Submittals not required by the Contract Documents may not be reviewed and will be returned to the Contractor with notation that the submittal is not required and will not be reviewed.

**END OF SECTION**

**SECTION 01 3216  
CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.

**1.02 RELATED SECTIONS**

- A. Section 01 1000 - Summary: Work sequence.

**1.03 REFERENCE STANDARDS**

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

**1.04 SUBMITTALS**

- A. Within 7 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 5 days.
- C. Within 5 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

**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 430 mm).
- C. Sheet size: Multiple of 8 -1/2 x 11 inches (216 x 280 mm).
- D. Scale and Spacing: To allow for notations and revisions.

**PART 2 PRODUCTS****2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL**

- A. Time Frame: Extend schedule from the date established for the Notice to Proceed to the date of Final Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or area as a separate numbered activity for each principal element of the work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
  - 2. Procurement Activities: Include procurements process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to submittals, approvals, purchasing, fabrication, and delivery.
  - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittals" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittal Schedule.
  - 4. Startup and Testing Time: Include not less than 14 days for startup and testing.
  - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show for the sequence of the work is affected.
  - 1. Phasing: Arrange list of activities on schedule by phase.

2. Products Ordered in Advance: Indicate a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary". Delivery dates indicated stipulate the earliest possible delivery date.
  3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities for the following:
    - a. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, and Final Completion.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.
  2. Contractor shall assign cost to construction activities on the schedule. Cost shall not be assigned to submittal activities unless specified otherwise, but may, with Architect's approval, be assigned to fabrication and delivery activities. Cost shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manual, punch list activities, Project Record Documents and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
  3. Each activity cost shall reflect an accurate value subject to approval by Architect.
  4. Total cost assigned to activities shall equal the total Contract Sum.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

### **PART 3 EXECUTION**

#### **3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a preliminary network diagram.

#### **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 for each stage of Work identified in Section 01 1000 - Summary.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. 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.
- H. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.
- I. Provide legend for symbols and abbreviations used.

#### **3.03 NETWORK ANALYSIS**

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may



restrain start of subsequent activities.

- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
  - 1. Preceding and following event numbers.
  - 2. Activity description.
  - 3. Estimated duration of activity, in maximum 15 day intervals.
  - 4. Earliest start date.
  - 5. Earliest finish date.
  - 6. Actual start date.
  - 7. Actual finish date.
  - 8. Latest start date.
  - 9. Latest finish date.
  - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
  - 11. Monetary value of activity, keyed to Schedule of Values.
  - 12. Percentage of activity completed.
  - 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
  - 1. By preceding work item or event number from lowest to highest.
  - 2. By amount of float, then in order of early start.

#### **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 RECOVERY SCHEDULE**

- A. If the projected Substantial Completion Date has negative float, the project is behind schedule. If the project is behind schedule, and upon written notification by the Owner, the Contractor shall submit a recovery schedule to the Owner identifying adjustments in the Contractor's work plan and workforce to complete the project within the contractual time frame. The recovery schedule shall be submitted in accordance with the standards established by this section. The Contractor shall submit this recovery schedule within five (5) calendar days after the dated notification. If the Contractor fails to submit this recovery schedule within the specified time frame, the Contractor shall be in non-compliance with these contract provisions and all payments will be withheld until the recovery schedule is submitted and approved by the Owner. Failure on the part of the Contractor to submit the recovery schedule within ten (10) calendar days after the notification will constitute a contractual default. The Owner reserves the right to notify the Contractor's Bonding Agent of this contractual default.

#### **3.07 DISTRIBUTION OF SCHEDULE**

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

**END OF SECTION**

**SECTION 01 4000  
QUALITY REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Mock-ups.
- I. Tolerances.
- J. Manufacturers' field services.
- K. Defect Assessment.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

**1.03 REFERENCE STANDARDS**

- A. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.
- B. 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.
- C. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.
- D. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

**1.04 DEFINITIONS**

- A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
  - 1. Design Services Types Required:
    - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
    - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

**1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES**

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary scaffolding.
2. Temporary bracing.
3. Temporary stairs or steps required for construction access only.
4. Investigation of soil conditions to support construction equipment.

#### **1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES**

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
  1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
  1. Structural Design of Canopy: As described in Section 10 7316.13 - Metal Canopies.
  2. Structural Design of Foundation: As described in Section 10 7500 - Flagpoles.
  3. Design of Structural Components: As described in Section 14 2400 - Hydraulic Elevators.
  4. Sprinkler Layout: Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 21 1300 - Fire-Suppression Sprinkler Systems.

#### **1.07 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
  1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
  2. Include required product data and shop drawings.
  3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
  4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. 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 compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
  1. Indicate material or product 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.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
  1. Submit report in duplicate within 30 days of observation to Architect for information.
  2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
  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 Owner.

#### **1.08 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
  1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

#### **1.09 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.

#### **1.10 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

### **PART 3 EXECUTION**

#### **2.01 CONTROL OF INSTALLATION**

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

#### **2.02 MOCK-UPS**

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
  - 1. See detail of mock-up on the drawings.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.
- D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
  - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
  - 2. Make corrections as necessary until Architect's approval is issued.
- G. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- H. 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.

#### **2.03 TOLERANCES**

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

#### **2.04 TESTING AND INSPECTION**

- A. See individual specification sections for testing and inspection required.

- B. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
  - 5. Perform additional tests and inspections required by Architect.
  - 6. 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 Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

## **2.05 MANUFACTURERS' FIELD SERVICES**

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

## **2.06 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not 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 TESTS AND SPECIAL INSPECTIONS****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
  - 3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Related Sections include but are not limited to the following:
  - 1. 03 3000 CAST-IN-PLACE CONCRETE.
  - 2. 05 1200 STRUCTURAL STEEL.
  - 3. 05 3100 STEEL DECK.

**1.03 DEFINITIONS**

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.
- B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.
- C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.
- E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.



- F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

#### 1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
  - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
    - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
  - 2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

#### 1.05 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design professional in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.
- D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

#### 1.06 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.

1. Special inspection reports and test results shall include, but not be limited to, the following:
  - a. Date of inspection.
  - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
  - c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
    - 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
  - d. Name and signature of special inspector and / or testing agency representative performing the work.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.
- D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

## **PART 2 PRODUCTS (not used)**

## **PART 3 EXECUTION**

### **3.01 CONTRACTOR'S RESPONSIBILITY**

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.
- C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
  1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
  2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
  3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
  4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
  1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
  2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
  3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.

4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
  1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
  2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
  3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- F. The contractor shall be responsible for costs of:
  1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
  2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
  3. Repair or replacement of work that does not meet the requirements of the construction documents.

### 3.02 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

### 3.03 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

## **PART 4 SCHEDULES AND FORMS (ATTACHED)**

4.01 STATEMENT OF SPECIAL INSPECTIONS.

4.02 SCHEDULE OF SPECIAL INSPECTIONS.

4.03 FINAL REPORT OF SPECIAL INSPECTIONS.

### **END OF SECTION**

# STATEMENT OF SPECIAL INSPECTIONS

Project: Pell City Fire Station #2

Project Address:

Permit Applicant: TBD

Applicant Address: TBD

Owner: City of Pell City

Owner Address:

## Registered Design Professionals (RDP):

Architect: CMH Architects

Geotechnical Engineer:

Structural Engineer: MBA Engineers, Inc.

Mechanical Engineer: MW/DDA

Electrical Engineer: Hyde Engineering

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than \_\_\_\_\_.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Building Official's Acceptance:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Permit No.

Frequency of interim report submittals to building official:

Monthly

Bi-Monthly

Upon Completion

Per Attached Schedule

RDP in Responsible Charge





## Required Special Inspections

**Project Name Pell City Fire Station #2**

**Project Address**

During construction of the referenced project, it is intended that special inspection as outlined in Chapter 17 of the 2021 International Building Code be provided for by the owner. The following areas of work will require special inspection:

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
<b>A. Inspection of Steel Fabrication Process per 1704.2.5.1</b> (Not required if fabricator is registered and approved per Section 1704.2.5.2)	Periodic	Testing Agent
<b>B. Inspection of Steel per 1705.2 (in accordance with quality assurance inspection requirements of AISC 360).</b>		
1. Inspection of welding:		
a. Prior to welding:		
1. Welding procedure specifications available	Continuous	Testing Agent
2. Manufacturer certifications for welding consumables available	Continuous	Testing Agent
3. Material identification (type/grade)	Periodic	Testing Agent
4. Welder identification system	Periodic	Testing Agent
5. Fit-up of groove welds (including joint geometry)	Periodic	Testing Agent
6. Configuration and finish of access holes	Periodic	Testing Agent
7. Fit-up of fillet welds	Periodic	Testing Agent
b. During welding:		
1. Use of qualified welders	Periodic	Testing Agent
2. Control and handling of welding consumables	Periodic	Testing Agent
3. No welding over cracked welds	Periodic	Testing Agent
4. Environmental conditions	Periodic	Testing Agent
5. Welding specification procedure followed	Periodic	Testing Agent
6. Welding Techniques	Periodic	Testing Agent
c. After welding:		
1. Welds cleaned	Periodic	Testing Agent
2. Size, length, and location of welds	Continuous	Testing Agent
3. Welds meet visual acceptance criteria	Continuous	Testing Agent
4. Arc strikes	Continuous	Testing Agent
5. K-area	Continuous	Testing Agent
6. Backing removed and weld tabs removed	Continuous	Testing Agent
7. Repair activities	Continuous	Testing Agent
8. Document acceptance or rejection of welded joint or member	Continuous	Testing Agent
2. Inspection of high-strength bolting:		
a. Prior to bolting:		
1. Manufacturer's certifications available	Continuous	Testing Agent
2. Fasteners marked in accordance with ASTM requirements	Periodic	Testing Agent
3. Proper fasteners selected for the joint detail	Periodic	Testing Agent
4. Proper bolting procedure for the joint detail	Periodic	Testing Agent
5. Connecting elements meet applicable requirements	Periodic	Testing Agent
6. Pre-installation verification testing by installation personnel	Periodic	Testing Agent

observed and documented for fastener assemblies and methods used		
7. Proper storage provided for bolts, nuts, washers, and other fastener components	Periodic	Testing Agent
b. During bolting:		
1. Fastener assemblies placed in all holes and washers (if required) are positioned as required	Periodic	Testing Agent
2. Joint brought to the snug-tight condition prior to the pretensioning operation	Periodic	Testing Agent
3. Fastener component not turned by the wrench prevented from rotating	Periodic	Testing Agent
4. Fasteners are pretensioned in accordance with the RCSC specification progressing systematically from the most rigid point toward the free edges	Periodic	Testing Agent
c. After bolting:		
1. Document acceptance or rejection of bolted connections	Continuous	Testing Agent
3. Inspection of steel elements of composite construction prior to concrete placement:		
a. Placement and installation of steel deck	Continuous	Testing Agent
b. Placement and installation of steel headed stud anchors	Continuous	Testing Agent
c. Document acceptance or rejection of steel elements	Continuous	Testing Agent
4. Steel construction other than structural steel per 1705.2.2:		
a. Material verification of cold-formed steel deck:		
1. Identification markings to confirm to ASTM standards specified in the approved construction documents	Periodic	Testing Agent
2. Manufacturer's certified test reports	Periodic	Testing Agent
b. Inspection of welding:		
1. Cold-formed steel deck:		
a. Floor and roof deck welds	Periodic	Testing Agent
2. Reinforcing steel:		
a. Verification of weldability of reinforcing steel other than ASTM A706	Periodic	Testing Agent
b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement	Continuous	Testing Agent
c. Shear reinforcement	Continuous	Testing Agent
d. Other reinforcing steel	Periodic	Testing Agent

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
<b>C. Inspection of Concrete per 1705.3 – 1705.3.1 &amp; Table 1705.3</b>		
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	Periodic	Testing Agent
2. Inspection of reinforcing steel welding in accordance with Table 1705.2.2, Item 2b.	-----	-----
3. Inspection of anchors cast in concrete where allowable loads have been increased, or where strength design has been used.	Periodic	Testing Agent
4. Inspection of anchors post-installed in hardened concrete members.	Periodic	Testing Agent
5. Verifying use of required design mix.	Periodic	Testing Agent
6. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Continuous	Testing Agent
7. Inspection of concrete and shotcrete placement for proper application techniques.	Continuous	Testing Agent
8. Inspection for maintenance of specified curing temperature and techniques.	Periodic	Testing Agent
9. Inspection of prestressed concrete:		
a. Application of prestressing forces.	Continuous	Testing Agent
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	Continuous	Testing Agent
10. Erection of precast concrete members.	Periodic	Testing Agent
11. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Periodic	Testing Agent
12. Inspect formwork for shape, location, and dimensions of the concrete member being formed.	Periodic	Testing Agent

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
<b>D. Inspection of Soil Conditions per 1705.6</b>		
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Periodic	Testing Agent
2. Verify excavations are extended to proper depth and have reached proper material.	Periodic	Testing Agent
3. Perform classification and testing of compacted fill materials.	Periodic	Testing Agent
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	Continuous	Testing Agent
5. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.	Periodic	Testing Agent

# FINAL REPORT OF SPECIAL INSPECTIONS

Project: Pell City Fire Station #2

Project Address:

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered  to , form a basis for, and are to be considered an integral part of this final report.

Prepared By:

---

Type or print name

---

Signature Date

Special Inspector's Seal

(Licensed Professional Engineer)





**SECTION 01 5000  
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**

- A. Owner will provide the following:
  - 1. Electrical power, consisting of connection to existing facilities.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

**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 Service: Minimum one line either land line or dedicated wireless service available at all times workman are present on site.
  - 3. Internet Connections: Minimum of one; DSL modem or faster.
  - 4. Email: Account/address available for use during this project.

**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, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.06 FENCING**

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

**1.07 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

**1.08 VEHICULAR ACCESS AND PARKING**

- A. Coordinate access and haul routes with governing authorities and Owner.

- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

**1.09 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. 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.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.10 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 7000  
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 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- G. Section 07 8400 - Firestopping.
- H. Individual Product Specification Sections:
  - 1. Advance notification to other sections of openings required in work of those sections.
  - 2. Limitations on cutting structural members.

**1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in 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.
5. Work of Owner or separate Contractor.
6. Include in request:
  - a. Identification of Project.
  - b. Location and description of affected work.
  - c. Necessity for cutting or alteration.
  - d. Description of proposed work and products to be used.
  - e. Alternatives to cutting and patching.
  - f. Effect on work of Owner or separate Contractor.
  - g. Written permission of affected separate Contractor.
  - h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### **1.05 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 design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

#### **1.06 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. 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.
- 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. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- 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.

#### **1.07 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.

- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 PREPARATION**

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

### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.

- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.04 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish 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; and \_\_\_\_\_.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations, and \_\_\_\_\_.
- 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 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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.

- C. 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.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.
  - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### **3.07 PROGRESS CLEANING**

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

### **3.08 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. 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.
- H. Prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.09 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.

- B. 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.

### **3.10 DEMONSTRATION AND INSTRUCTION**

- A. See Section 01 7900 - Demonstration and Training.

### **3.11 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- C. Cover and cap HVAC ductwork at all times until startup.

### **3.12 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, scuppers, overflow drains, 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.

### **3.13 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and Owner.
- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. 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.



- D. 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.
- E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- G. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### **3.14 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of the items on the list, and why the items are not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Prepare and submit Project Record Documents, Operation and Maintenance Manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  - 4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 5. Make final changeover of permanent cores at locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 6. Complete startup testing of systems
  - 7. Terminate and remove all temporary facilities from the site, along with any mock-ups, construction tools, equipments and similar items.
  - 8. Advise Owner of need to changeover the utilities to Owner's name.
  - 9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  - 10. Complete final cleaning requirements, including touchup painting.
  - 11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  - 12. Provide required certificates from state and local authorities for the approval of the following systems:
    - a. Fire Alarm
    - b. Fire Suppression Systems
  - 13. Submit certified copy from the publication(s) of the Advertisement of Completion if required for the project.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify the Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantion completion after inspection or will notify contractor of tiems, either on Contractor's list or additional items identified by Architect that must be completed or corrected before certificate will be issued.
  - 1. Re-inspection: Request re-inspection when the Work identified in the previoius inspection as incomplete is completed or corrected.
  - 2. Results of te completed inspection will form the basis of requirements for Final Completion.

### **3.15 FINAL COMPLETION**

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
  - 1. Submit a final " Application for Payment" according to Section 00 1200 - Price and Payment Procedures.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the Architect. Each item on the list shall be initialed by the Contractor that the item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with the insurance requirement of the Contract Documents.
  4. Submit a "Consent of Surety to Final Payment" form executed with final "Application for Payment."
- B. Inspection: Submit a written request for inspection for Final Completion inspection. On receipt of request, Architect will either proceed with inspection or notify the Contractor of unfulfilled requirements. After inspection, Architect will approved the Final Application for Payment, or will notify contractor of items, that must be completed or corrected before Final Payment can be made.
1. Re-inspection: Request reinspection when any items indentified as incomplete have been corrected.

### **3.16 LIST OF INCOMPLETE ITEMS (PUNCH LIST)**

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page.
    - a. Project Name
    - b. Date
    - c. Name of Architect
    - d. Name of Contractor
    - e. Page Number

### **3.17 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 017320  
SELECTIVE DEMOLITION**

**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. Demolition and removal of selected portions of building or structure.
  - 2. Demolition and removal of selected site elements.
  - 3. Salvage of existing items to be reused or recycled.

**1.3 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

**1.4 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

**1.5 PREINSTALLATION MEETINGS**

- A. Predemolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- C. Predemolition Photographs or Video: Submit before Work begins.
- D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

**1.7 CLOSEOUT SUBMITTALS**

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

**1.8 FIELD CONDITIONS**

- A. Owner may occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform an engineering survey of condition of existing structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
  - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

**3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
  - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01500 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

### **3.4 SELECTIVE DEMOLITION, GENERAL**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  9. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

### **3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS**

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roof membrane, flashings, copings, and roof accessories.

2. Remove existing roofing system down to substrate.

### **3.6 DISPOSAL OF DEMOLISHED MATERIALS**

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

1. Do not allow demolished materials to accumulate on-site.

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

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

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

C. Disposal: Transport demolished inert concrete materials and dispose of at designated spoil areas on Owner's property. Transport all other demolished materials off Owner's property and legally dispose of them.

### **3.7 CLEANING**

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

**END OF SECTION 017320**



**SECTION 01 7419  
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

**PART 1 GENERAL****1.01 WASTE MANAGEMENT REQUIREMENTS**

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

**1.02 RELATED REQUIREMENTS**

- A. Section 01 2500 - Substitution Procedures.
- B. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 01 6000 - Product Requirements: Waste prevention requirements related to product substitutions.
- E. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- F. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- G. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

**1.03 DEFINITIONS**

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

## **PART 2 PRODUCTS**

### **2.01 PRODUCT SUBSTITUTIONS**

- A. See Section 01 6000 and Section 01 2500.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
  - 1. Relative amount of waste produced, compared to specified product.
  - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
  - 3. Proposed disposal method for waste product.
  - 4. Markets for recycled waste product.

## **PART 3 EXECUTION**

### **3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### **3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- C. Meetings: Discuss trash/waste management goals and issues at project meetings.
  - 1. Prebid meeting.
  - 2. Preconstruction meeting.
  - 3. Regular job-site meetings.

- D. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  - 1. Provide containers as required.
  - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- E. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- F. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- G. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- H. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

**END OF SECTION**

**SECTION 01 7800  
CLOSEOUT SUBMITTALS  
END OF SECTION**

**SECTION 01 7810  
PROJECT RECORD DOCUMENTS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.

**1.03 RELATED SECTIONS**

- A. Section 01 7000 - Execution and Closeout Requirements: for general closeout procedures.
- B. Section 01 7800 - Closeout Submittals: for specific requirements of closeout submittals.
- C. Individual Product Sections: Specific requirements for Project Record Documents required for that portion of the Work.

**1.04 SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one (1) set of marked-up (red-line) Record Prints. Architect review each sheet and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.
    - b. Final Submittal:
      - 1) Submit two (2) printed sets of marked-up (red line) Record Prints with corrections from the initial review,
      - 2) Submit two (2) printed sets of the corrected As-Built drawings. Print each Drawing (complete set) whether or not changes or additional information was added.
      - 3) One (1) thumbdrives with the following:
        - (a) As-Built Drawings in AutoCAD (current version) incorporating the marked-up Record Prints
        - (b) Digital .pdf format set of As-Built Drawings,
        - (c) Digital .pdf format set of the marked- marked up (red line) drawings.
- B. Record Specifications:
  - 1. Submit one (1) printed set of Project's Specifications, including all addenda and contract modifications bound into an As-Built Specif
  - 2. Provide digital .pdf format set of the As-Built Specifications on thumbdrive.
- C. Record Product Data:
  - 1. Submit one (1) copy of each Product Data submittal.
    - a. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
  - 2. Submit one complete digital copy of Product Data on thumbdrive.

**PART 2 PRODUCTS****2.01 RECORD DRAWINGS**

- A. Record Prints: Maintain one (1) set of black-line white prints of the Contract Drawings and Shop Drawings on site.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Accurately record information in an understandable drawing technique.
    - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    - c. The set shall be available for review by the Architect at any time. If Architect finds the set is not up to date, the missing information shall immediately be added to the set. Pay Applications will not be processed until any missing information is recorded on the Record Prints in a manner acceptable to the Architect.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record As-Built Documents: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected As-Built Drawings in AutoCAD (current version) of the Contract Drawings.
1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
  2. Refer instances of uncertainty to Architect for resolution.
  3. Refer to submittal requirement above for formats and copies to be submitted.
  4. Architect will make the Contract Drawings available to Contractor for preparation of the As-Built documents.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" on marked up prints and "AS-BUILT DRAWING" on AutoCAD drawings in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared As-Built Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Identification: As follows:

- a. Project name.
- b. Date.
- c. Designation "PROJECT RECORD DRAWINGS." Or "AS-BUILT DRAWINGS" as appropriate.
- d. Name of Architect.
- e. Name of Contractor.

## **2.02 RECORD SPECIFICATIONS**

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders and Record Drawings where applicable.
  6. Refer to submittal requirements above for formats and copies to be provided.

## **2.03 RECORD PRODUCT DATA**

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders and Record Drawings where applicable.
  4. Refer to submittal requirements above for formats and copies to be provided.

## **2.04 MISCELLANEOUS RECORD SUBMITTALS**

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## **PART 3 EXECUTION**

### **3.01 RECORDING AND MAINTENANCE**

- A. Recording: Maintain one (1) copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

**SECTION 02 2413  
JURISDICTIONAL EVALUATION REPORT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Jurisdictional Evaluation Report, dated July 10, 2023, by Environmental, Inc., attached to this Section.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 3000 - Administrative Requirements: Project meetings, progress schedules and documentation, reports, coordination.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures.
- D. Section 01 7000 - Execution and Closeout Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- E. Section 02 3132 -Geotechnical Field Observation Report.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**PART 4 ATTACHMENTS**

**4.01 JURISDICTIONAL EVALUATION REPORT, DATED JULY 10, 2023, BY ENVIRONMENTAL, INC., ATTACHED TO THIS SECTION.**

**END OF SECTION**



**SECTION 02 3132  
GEOTECHNICAL FIELD OBSERVATION REPORT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Report of Field Observation, dated May 7, 2024, by Terracon, attached to this Section..

**1.02 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 3000 - Administrative Requirements: Project meetings, progress schedules and documentation, reports, coordination.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures.
- D. Section 01 7000 - Execution and Closeout Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- E. Section 02 4100 - Jurisdictional Evaluational Report.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**PART 4 ATTACHMENTS**

**4.01 REPORT OF FIELD OBSERVATION, DATED MAY 7, 2024, BY TERRACON.**

**END OF SECTION**

# Pell City Fire Station No. 2

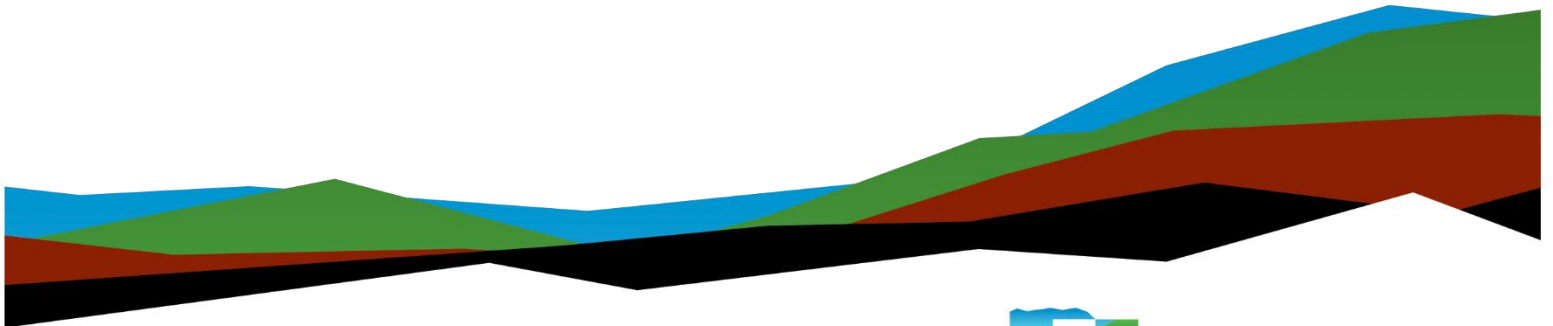
U.S. Highway 231, Pell City, Alabama

## Geotechnical Engineering Report

May 7, 2024 | Terracon Project No. E1235176

### Prepared for:

CMH Architects  
1800 International Park Drive  
Birmingham, Alabama 35243



Nationwide  
[Terracon.com](https://www.terracon.com)

- Facilities
- Environmental
- Geotechnical
- Materials



2147 Riverchase Office Road  
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[Terracon.com](https://www.terracon.com)

May 7, 2024

CMH Architects  
1800 International Park Drive  
Ashville, Alabama 35243

Attn: Mr. Billy Morace  
P: (205) 969-2696  
E: [bmorace@cmharch.com](mailto:bmorace@cmharch.com)

Re: Geotechnical Engineering Report  
Pell City Fire Station No. 2  
US Highway 231  
Pell City, Alabama  
Terracon Project No. E1235176

Dear Mr. Morace:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PE1235176.rev1 dated April 3, 2024 and supplemental change order for MASW testing. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, pavements, permanent slopes, and other site development elements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

**Terracon**

Samuel W. Wheeler, P.E.  
Project Engineer

Bryan C. Ritenour, P.E.  
Senior Engineer

**Geotechnical Engineering Report**

Pell City Fire Station No. 2 | Pell City, Alabama  
May 7, 2024 | Terracon Project No. E1235176



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### Exploration and Testing Procedures

### Site Location and Exploration Plans

### Exploration and Laboratory Results

### Supporting Information

**Note:** This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  Terracon logo will bring you back to this page. For more interactive features, please view your project online at [client.terracon.com](http://client.terracon.com).

Refer to each individual Attachment for a listing of contents.

## Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed new Fire Station No. 2 located on US Highway 231 in Pell City, Alabama. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Slope recommendations for permanent slopes
- Lateral earth pressures for rigid retaining walls
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of 13 test borings, engineering analysis, and preparation of this report. Test borings were advanced to depths ranging from 5 to 40 feet below existing site grades.

Drawings showing the site and boring locations are shown on the [Site Location](#) and [Exploration Plan](#), respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs or individual report sheets in the [Exploration Results](#) section.

## Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
<b>Information Provided</b>	The site location, layout, and topographic survey was provided by CMH Architects.
<b>Project Description</b>	We understand that the project will consist of a new 16,000 SF Fire Station with the associated drive lanes and parking.

Item	Description
<b>Building Construction</b>	Assumed steel frame and/or load bearing masonry with brick veneer
<b>Finished Floor Elevation</b>	FFE = approximately 493 feet
<b>Maximum Loads</b>	<ul style="list-style-type: none"> <li>■ Columns: 150 kips (assumed)</li> <li>■ Walls: 2 to 4 kips per linear foot (klf) (assumed)</li> <li>■ Floor Slabs: 100 to 150 pounds per square foot (psf) (assumed)</li> </ul>
<b>Grading/Slopes</b>	<p>The site will require both cuts and fills to achieve final grade. Based on the provided FFE, cuts of up to about 35 feet and fills of up to about 10 feet will be required to grade the site.</p> <p>A grading plan has not been provided at the time of this report.</p>
<b>Below-Grade Structures</b>	None anticipated
<b>Free-Standing Retaining Walls</b>	Retaining walls may be required to accommodate grade changes.
<b>Pavements</b>	<p>Paved driveway and parking will be constructed. Anticipated traffic loading was not available at the time this report was prepared. In the absence of traffic data from the design team, we have assumed that the traffic classification will consist of:</p> <ul style="list-style-type: none"> <li>■ Automobile traffic – 200 passenger cars per day</li> <li>■ Truck traffic – 2 trucks per day</li> </ul> <p>The pavement design period is 20 years</p>
<b>Building Code</b>	2018 IBC (assumed)

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

## Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.



Item	Description
<p><b>Parcel Information</b></p>	<p>The site is a roughly 42-acre parcel located in Pell City, Alabama along the west side of U.S. Highway 321 south of the intersection with Cropwell Drive.</p> <p>The approximate GPS coordinates are: 33.5507° N, 86.2794° W (See <a href="#">Site Location</a>)</p>
<p><b>Existing Improvements</b></p>	<p>None</p>
<p><b>Current Ground Cover</b></p>	<p>Mature trees, brush, and exposed soil. Several unimproved trails and/or dirt roads are also present.</p>
<p><b>Existing Topography</b></p>	<p>The site contains steep and rolling topography and generally slopes downward from the northwest to the southeast, with surface grades ranging from about EL. 480 to EL. 525 within the proposed project area.</p>
<p><b>Local Geology</b></p>	<p>Published maps indicate the site is underlain by the undifferentiated Knox Group. This formation contains light-gray to light-brown locally sandy dolomite, dolomitic limestone, and limestone; characterized by abundant light-colored chert.</p> <p>Although no evidence of sinkhole activity was observed during our subsurface exploration on the proposed site, it should be noted that this study does not preclude the possibility of future sinkhole occurrence within the area. Even an extensive drilling exploration program could not rule out the possibility of future sinkhole formation at the site. The owner must accept that there is some degree of risk in developing over carbonate rock geology</p>

## Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the [Exploration Results](#) and the GeoModel can be found in the [Figures](#) attachment of this report.

As part of our analyses, we identified the following model layers within the boring subsurface profile. For a more detailed view of the model layer depths at each boring

location, refer to the boring GeoModel. Borings from the 2015 preliminary investigation were not included in developing this Model.

Model Layer	Layer Name	General Description
1	Topsoil	Topsoil (4" to 7" at boring locations)
2	Lean Clay	Lean Clay and Sandy Lean Clay with varying amounts of sand and gravel, Soft layers encountered in B-3, B-4, B-5, P-1, P-2, and P-5.
3	Fat Clay	Fat Clay with varying amounts of gravel, generally stiff to very stiff.
4	Silt	Sandy Silt, stiff to very stiff

The borings were advanced using a hollow stem auger drilling technique that allows short term groundwater observations to be made while drilling. Groundwater was observed in multiple borings during drilling, the table below indicates approximate depth and elevation of encountered groundwater.

Boring	Ground Surface Elevation (ft)	Approximate Depth to Groundwater During Drilling (ft)	Approximate Groundwater Elevation During Drilling (ft)
B-1	496	N/E <sup>1</sup>	N/E <sup>1</sup>
B-2	509	N/E <sup>1</sup>	N/E <sup>1</sup>
B-3	502	N/E <sup>1</sup>	N/E <sup>1</sup>
B-4	486	5	481
B-5	497	N/E <sup>1</sup>	N/E <sup>1</sup>
P-1	484	3	481
P-2	485	3	482

Boring	Ground Surface Elevation (ft)	Approximate Depth to Groundwater During Drilling (ft)	Approximate Groundwater Elevation During Drilling (ft)
P-3	503	N/E <sup>1</sup>	N/E <sup>1</sup>
P-4	515	N/E <sup>1</sup>	N/E <sup>1</sup>
P-5	489	N/E <sup>1</sup>	N/E <sup>1</sup>
S-1	525	N/E <sup>1</sup>	N/E <sup>1</sup>
S-2	530	35	494
S-3	520	30	490

1. Not encountered during drilling or in the short time the boring was left open

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Springs could emerge, particularly from the cut slopes, anytime during the life of the project. It is common for springs to emerge from the porous chert seams present in the residual soils of the Knox Group.

## Seismic Site Class

Terracon performed geophysical exploration services on April 29, 2024 consisting of a seismic survey at the project site. Terracon used a seismic refraction system (SRS) consisting of a seismograph and 24 geophones to perform a site specific seismic class survey. Two linear arrays of 24 geophones were placed in an accessible location best encompassing the proposed building pad, as illustrated on the [Exploration Location Plan](#). The arrays were oriented perpendicular to each other at the location. A computer was used to record refraction microtremors produced by ambient seismic noise. The data was then processed using a wavefield-transformation data-processing technique and an interactive Rayleigh-wave dispersion-modeling tool. The refraction microtremor method exploits aspects of spectral analysis of surface waves (SASW) and multi-channel analysis of surface waves (MASW) to derive a shear wave profile and an average shear-wave velocity along the array for a corresponding depth of about 100 feet.

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The International Building Code (IBC) requires structural design to be in accordance with the appropriate site class definition for soil profile type. Based upon the Site Class Definitions in IBC 2018, Section 1613.3.2, which refers to ASCE 7, Chapter 20, Table 20.3-1, and the average shear wave velocities of 1,403 ft/s and 1,341 ft/s as derived from our seismic survey data, Terracon recommends a **Class C** seismic site classification for the site. The shear wave velocity profiles can be found in the [Exploration Results](#) section.

Note that the shear-wave velocities derived from the ReMi survey performed as part of this project are only one factor in determining the seismic site classification. Results from the soil borings should also be taken into consideration as well as facility type and other potential risks.

## Geotechnical Overview

The site can be developed for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

Topsoil ranging in thickness from 4 to 7 inches was encountered across the site. However, because tree and brush clearing was required to access the boring locations, we note that thicker topsoil deposits could be encountered between and away from our exploration points, especially in lower areas.

Underlying the topsoil, native materials were encountered in all borings. Native materials consist of lean and fat clays with varying amounts of sand and gravel. Silts were encountered boring P-4. Relatively shallow deposits of soft to medium stiff materials were encountered borings B-1, B-3, B-4, B-5, P-1, P-2, P-5, and S-3. Where these materials were encountered below proposed final grades, undercutting of the marginal materials will be required prior to placing fill.

Borings P-1 through P-5 were advanced in planned paved areas. Borings B-1 through B-5 were advanced within the proposed building pad. Based on the borings and the planned finished floor elevation of 493 feet, it is anticipated that high plasticity clays and elastic silts will be encountered at the final subgrade elevations in portions of the paved and building areas. The clays and silts are difficult to work at elevated moisture content and could require stabilization methods described later.

After the stripping of the site and performing the planned cuts and undercutting of unstable soils, the exposed subgrade should be compacted and then proof-rolled under the observation of the Geotechnical Engineer as further discussed in the [Earthwork](#)

section of this report. Any soft, loose, or otherwise unstable soils excessively deflecting during the proof-roll should be undercut and replaced with structural fill or stabilized as discussed in the **Earthwork** section of this report.

Based on the conditions encountered, the proposed structures can be supported on conventional continuous or spread footing foundations bearing on new engineered fill and/or stiff or better native soils.

High plasticity soils will be exposed at the finished subgrade elevations in the southwest portions of the building pad, and may be exposed between and away from our boring locations during site grading. High plasticity soils typically “expand” or “swell” as their moisture contents increase. However, these soils may also “contract” or “shrink” as their moisture contents decrease. Based on the laboratory tested liquid limits, and coarse fraction content measured in the tested fat clay samples, there appears to be a low risk of significant shrink/swell, therefore footings, floor slabs and pavements may be founded directly on these soils without the need for a low plasticity engineered fill buffer. However, measures described later in this report to reduce the risk of significant moisture fluctuation should be followed.

The onsite soils that are free of organics are considered suitable for re-use as structural fill. Some moisture conditioning (i.e., drying) of the existing fill soils should therefore be anticipated for onsite soils to be reused. The elevated moisture contents encountered in the soils below depths of about 20 to 30 feet within the eastern cut slope may preclude these soils as being practical for re-use as fill because of the timeframe required to properly moisture condition for re-use as fill. These soils may, however, be utilized as bridge lifts in deeper fill areas not underlying foundations or floor slabs. Furthermore, soils failing the proofroll test may require additional reworking and drying to be stabilized in place, especially if earthwork is performed during the winter months.

Fat clays and silts exposed after site grading will become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

## Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, pavements, and slopes.

### Subgrade Preparation

Prior to placing fill, any planted vegetation, topsoil, and root mats should be removed from the proposed buildings, parking/driveway areas, and fill slopes.

Topsoil ranging in thickness from 4 to 7 inches was encountered at the boring locations. However, because tree and brush clearing was required to access the boring locations, we note that thicker topsoil deposits will likely be encountered between and away from our exploration points, especially in low areas.

After stripping the site and making the necessary cuts to finish subgrade, but prior to fill placement, the exposed subgrade should be densified using a heavy vibratory roller having a maximum static weight of 12,000 lbs. and capable of exerting a minimum impact energy of 20,000 lbs.

After densification/compaction as described above, the subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. The project budget should include provisions for undercutting the soft soils encountered in the upper 3 to 4 feet at several borings. Such areas should either be removed, further densified in place, or stabilized by other methods discussed in the following sections, depending on site and weather conditions. Excessively wet or dry material should either be removed or moisture conditioned and recompacted. Compacted structural fill soils should then be placed to the proposed design grade and the moisture content and compaction of subgrade soils should be maintained until foundation or pavement construction.

Based on the subsurface investigation, high moisture content (and therefore poorly workable) soils will be excavated from the western cut areas. If moisture conditioning of elevated moisture content soils becomes too time consuming, excessively moist soils may be utilized as bridge lifts in deeper fill areas (in accordance with the [Soil Stabilization](#) section of this report).

The workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved

by scarifying and drying. Some moisture conditioning (i.e., drying) of the existing soils should be anticipated for onsite soils to be reused as fill. Furthermore, soils failing the proofroll test may require additional reworking and drying to be stabilized in place, especially if earthwork is performed during the winter months.

## Soil Stabilization

Unstable subgrades may develop in areas subjected to repetitive construction traffic or if earthwork is performed during the wetter and cooler periods of the year. Methods of subgrade improvement, as described below, could include scarification, moisture conditioning and recompaction, removal of unstable materials and replacement with granular fill (with or without geosynthetics), and chemical stabilization. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

- **Scarification and Recompaction** - It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Crushed Stone** - The use of crushed stone combined with high modulus geotextiles (i.e., engineered fabric or geogrid) is a common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 12 to 18 inches below finished subgrade elevation. Prior to placing the fabric or geogrid, we recommend that all below grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should not exceed 1-1/2 inches.
- **Bridge Lifts** - An initial, relatively thick "bridge" lift of properly moisture conditioned fill soil may be considered in areas outside of the buildings and slopes that are well below finish subgrade elevations but where the existing fill and native soil is not adequately stable to support a thinner, conventional lift of fill. The use of a relatively thick "bridge" lift can reduce the undercut of marginal soils by establishing a stable working surface for the placement and compaction of subsequent conventional lifts.

Bridge lifts should be at the recommendation of the Geotechnical Engineer and should not be started within 4 vertical feet of the finish subgrade. Typical bridge lift thickness is on the order of 18 to 24 inches. Following the placement and compaction of the relatively thick bridge lift in order to provide a stable working subgrade, subsequent, conventional lifts should be placed and compacted as described in the Fill Placement and Compaction Requirements section below.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

### Fill Material Types

Fill required to achieve design grade should be classified as structural fill. Structural fill is material used below, or within 10 feet of structures, pavements or constructed slopes.

**Reuse of On-Site Soil:** Excavated on-site soil may be reused as fill. Material property requirements for on-site soil for use as structural fill are noted in the table below:

Property	Structural Fill
Composition	Free of deleterious material
Maximum particle size	4 inches
Fines content	Not limited
Plasticity <sup>2</sup>	Liquid Limit less than 55 Plasticity index less than 30
GeoModel Layer Expected to be Suitable <sup>1,2,3</sup>	2, 3 and 4

1. Based on subsurface exploration.
2. Fat clay soils exposed during site grading at the building pad elevation may be re-used as structural fill at all locations and elevations provided they meet the plasticity criteria listed in this table.
3. Significant moisture conditioning (i.e., drying) may be necessary in soils with elevated moisture contents.

**Imported Fill Materials:** Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.



Soil Type <sup>1</sup>	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL, CL-ML ML, SM, SC	Liquid Limit less than 50 Plasticity index less than 25
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Less than 50% passing No. 200 sieve

1. Structural fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site. Additional geotechnical consultation should be provided prior to use of uniformly graded gravel on the site.

## Fill Placement and Compaction Requirements

Structural fill should meet the following compaction requirements.

Item	Structural Fill
<b>Soil Fill Lift Thickness</b>	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
<b>Minimum Compaction Requirements <sup>1</sup></b>	98% of max.
<b>Water Content Range <sup>1</sup></b>	Low to Moderate Plasticity Cohesive: -2% to +2% of optimum Granular: -3% to +4% of optimum

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).

## Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility to be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from

existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

On-site materials are considered suitable for backfill of utility and pipe trenches, provided the material is free of organic matter and deleterious substances. However, material used as trench backfill should comply with the pipe manufacturer or governing municipality's requirements.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs, footings, or pavements, the backfill should satisfy the gradation requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

## Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. In areas where hardscapes and/or paving do not abut against the structure, the roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

## Slope Design

No grading plan has been provided at the time of this report. Based on the provided Site Plan and topographic map, cut slopes of up to about 30 feet and fill slopes of up to about 10 feet could be required to reach the proposed subgrade elevation. Slopes should be graded no steeper than 3.0(H):1.0(V).

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the risk of failure along the fill/natural soil interface. Furthermore, we recommend that fill slopes be over filled and then cut back to develop an adequately compacted slope face.

Groundwater was observed in some borings, although generally below the proposed FFE. However, springs or perched water may be present but not become evident until site grading begins. Saturation of the slopes due to groundwater seepage or poor drainage can result in slope instability. Therefore "finger drains" are often required to prevent slope saturation. "Finger drains" could be warranted at any time during the life of the project as springs related to climatic conditions may not become evident until after construction, particularly if construction is performed during periods of low rainfall. Therefore, it is possible that the need for drains could become apparent anytime after construction.

Proper management of surface water runoff around the slopes will also contribute to the stability of permanent slopes. Positive drainage should be maintained at the top and bottom of the slopes. Drainage at the toe of the slope may be accomplished by installation of a French drain or equivalent measure that can collect runoff from the slope face and finger drains (if needed).

During construction, all slopes should be regularly inspected for signs of movement or unsafe conditions. The Geotechnical Engineer of Record should be contacted if movement is noted, if any slope should become saturated, if water should be observed seeping from the slope face, or if structures or other loads are planned at the top of any slope.

The grading contractor, by their contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Soil slopes should be covered for protection from rain, and surface runoff should be diverted away from the slopes. For erosion protection, a protective cover of vegetation should be established on slopes as soon as possible. Positive drainage should be maintained with ditches or channels at the top and bottom of the slope. In the fill slope areas, the pavement curbs at the tops of the slopes can serve as channels to divert water away from the slope face.

We recommend that the design of any mechanically reinforced slopes and/or MSE walls be made the responsibility of the design/build contractor. This would include sufficient exploration and testing to evaluate bearing capacity, global stability, strength

characteristics of the retained soils, reinforced soils, foundation materials, and drainage. The designer should evaluate post-construction settlements of the foundation soils and the fill mass along with any necessary preparation of the foundation soils. The designer should provide estimates of the anticipated movements and the time necessary for such movements to occur.

We note that the information contained in this report is not sufficient for, nor intended for, the design of mechanically reinforced slopes or mechanically stabilized earth walls. Wall and slope designers should perform an independent evaluation instead of relying on information in this report.

## Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompact prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

## Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square

feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 50 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer’s evaluation of subsurface conditions, including assessing variations and associated design changes.

## Shallow Foundations

Following the site preparation described above, the proposed structures may be supported on a conventional shallow spread footing foundation system bearing in the new engineered fill or stiff or better native soils.

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

### Design Parameters – Compressive Loads

Item	Description
<b>Maximum Net Allowable Bearing Pressure</b> <sup>1, 2</sup>	2,500 psf
<b>Required Bearing Stratum</b> <sup>3</sup>	Stiff/medium dense or better native soils, or new engineered fill
<b>Minimum Foundation Dimensions</b>	Per IBC 1809.7
<b>Ultimate Passive Resistance</b> <sup>4</sup> (equivalent fluid pressures)	330 pcf (cohesive backfill) 420 pcf (crushed stone)
<b>Sliding Resistance</b> <sup>5</sup>	0.30 ultimate coefficient of friction – onsite soil or structural fill 0.35 ultimate coefficient of friction - granular material
<b>Minimum Embedment below Finished Grade</b> <sup>6</sup>	18 inches
<b>Estimated Total Settlement from Structural Loads</b> <sup>2</sup>	Less than about 1 inch
<b>Estimated Differential Settlement</b> <sup>2, 7</sup>	About 1/2 of total settlement

Item	Description
<ol style="list-style-type: none"> <li>1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.</li> <li>2. Values provided are for maximum loads noted in <b>Project Description</b>. Additional geotechnical consultation will be necessary if higher loads are anticipated.</li> <li>3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in <b>Earthwork</b>.</li> <li>4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure. Apply a factor of safety of at least 1.5 when designing for lateral force resistance.</li> <li>5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations.</li> <li>6. Embedment necessary to minimize the effects of frost. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.</li> <li>7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.</li> </ol>	

### Design Parameters – Overturning and Uplift Loads

Shallow foundations subjected to overturning loads should be proportioned such that the resultant eccentricity is maintained in the center-third of the foundation (e.g.,  $e < b/6$ , where  $b$  is the foundation width). This requirement is intended to keep the entire foundation area in compression during the extreme lateral/overturning load event. Foundation oversizing may be required to satisfy this condition.

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils with consideration to the IBC basic load combinations.

Item	Description
<b>Soil Moist Unit Weight</b>	120 pcf
<b>Soil Effective Unit Weight<sup>1</sup></b>	60 pcf
<b>Soil weight included in uplift resistance</b>	Soil included within the prism extending up from the top perimeter of the footing at an angle of 20 degrees from vertical to ground surface

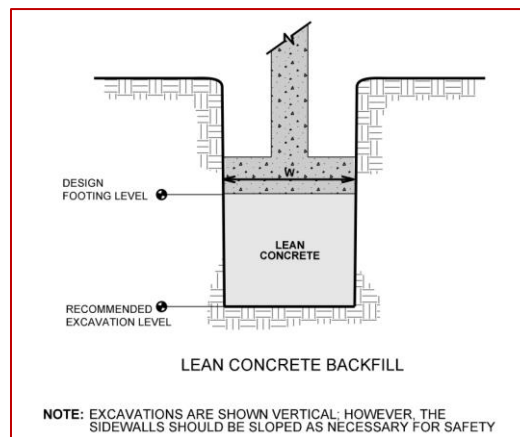
1. Effective (or buoyant) unit weight should be used for soil above the foundation level and below a water level. The high groundwater level should be used in uplift design as applicable.

## Foundation Construction Considerations

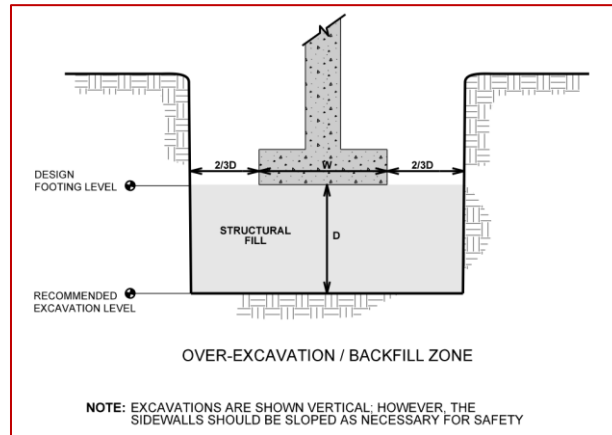
As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

Sensitive soils exposed at the surface of footing excavations may require surficial compaction with hand-held dynamic compaction equipment prior to placing structural fill, steel, and/or concrete. Should surficial compaction not be adequate, construction of a working surface consisting of either crushed stone or a lean concrete mud mat may be required prior to the placement of reinforcing steel and construction of foundations.

If unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement zone is illustrated on the sketch below.



Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation, with structural fill placed, as recommended in the **Earthwork** section.



## Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Depending upon the site and weather conditions at the time of construction, unsuitable, weak, and/or loose soils may be observed at the floor slab subgrade level. These soils should be densified in place or undercut and replaced with structural fill.

### Floor Slab Design Parameters

Item	Description
<b>Floor Slab Support<sup>1</sup></b>	Minimum 4 inches base course meeting material specifications of ACI 302 placed over new engineered fill or stiff/medium dense or better native soils.  Subgrade compacted to recommendations in <b>Earthwork</b>
<b>Estimated Modulus of Subgrade Reaction<sup>2</sup></b>	100 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.



The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

## Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

## Pavements

### Pavement Design Parameters

Specific traffic loading conditions have not been provided to us at the time of this study. A California Bearing Ratio (CBR) of 4 was used for the subgrade for the asphaltic concrete (AC) pavement designs. A modulus of subgrade reaction of 100 pci was

assumed for the Portland cement concrete (PCC) pavement designs. The value was derived based upon our experience with the clay subgrade soils at the site, and our expectation of the quality of the subgrade as prescribed by the **Site Preparation** conditions as outlined in **Earthwork**. A modulus of rupture of 580 psi was used in design for the concrete (based on correlations with a minimum 28-day compressive strength of 4,000 psi).

### Pavement Section Thicknesses

Our minimum recommended AC and PCC pavement sections are provided in the following paragraphs.

#### Asphaltic Concrete Design

Layer	Thickness (inches)	
	Light Duty	Heavy Duty
AC Wearing Surface <sup>1, 2</sup>	1.5	1.5
AC Binder <sup>1</sup>	2.0	2.5
Aggregate Base <sup>1</sup>	6.0	8.0

1. All materials should meet the current Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction.
  - Asphaltic Surface - ALDOT 424A Superpave Bituminous Concrete Wearing Surface Layer, ½ inch maximum aggregate size mix
  - Asphaltic Base - ALDOT 424B Superpave Bituminous Concrete Upper Binder Layer, ¾ inch maximum aggregate size mix
  - Aggregate Base – ALDOT 825B Dense Graded Aggregate Base, compacted to 100% of the modified Proctor
2. A minimum 1.0-inch surface course should be used on ACC pavements.

The following table provides our estimated minimum thickness of PCC pavements.

#### Portland Cement Concrete Design

Layer	Thickness (inches)	
	Light Duty	Heavy Duty And Dumpster Pad
PCC <sup>1</sup>	5.0	6.0

### Portland Cement Concrete Design

Layer	Thickness (inches)	
	Light Duty	Heavy Duty And Dumpster Pad
Aggregate Base	4.0	4.0

1. All materials should meet Section 450 of the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its “green” state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. To reduce the risk of excess water migrating into the surrounding subgrade, the curb and gutter could be placed directly on the cohesive soil subgrade rather than on the unbound granular base course.

### Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to

premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

## Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

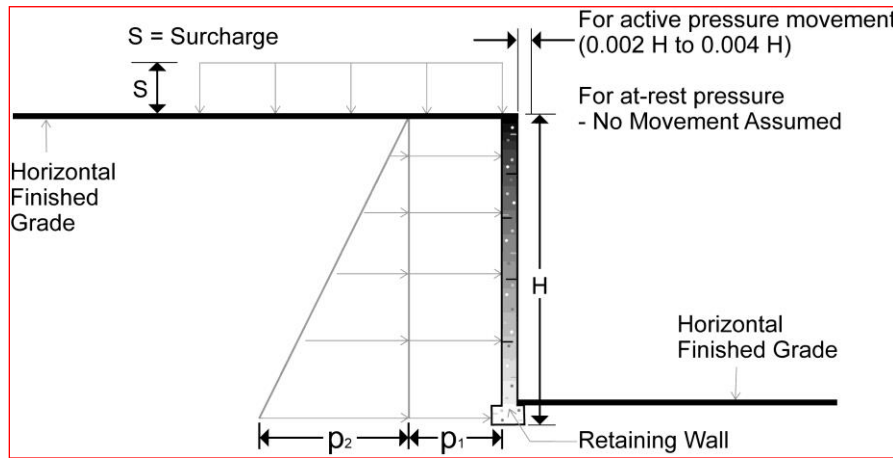
- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage, unless flatter slopes are required for ADA compliance.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on cohesive subgrade soils rather than on unbound granular base course materials.

## Lateral Earth Pressures

### Design Parameters

Parameters in this section are for rigid (i.e. cast-in-place concrete or masonry) retaining walls up to 10 feet in height. Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, and/or compaction and the

strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



**Lateral Earth Pressure Design Parameters**

Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3</sup> p <sub>1</sub> (psf)	Equivalent Fluid Pressures (psf) <sup>2,4</sup>	
			Unsaturated <sup>5</sup>	Submerged <sup>5</sup>
Active (K <sub>a</sub> )	Crushed Stone - 0.24	(0.24)S	(25)H	(75)H
	Fine Grained - 0.42	(0.42)S	(50)H	(85)H
At-Rest (K <sub>o</sub> )	Crushed Stone - 0.38	(0.38)S	(40)H	(80)H
	Fine Grained - 0.59	(0.59)S	(70)H	(95)H
Passive	Crushed Stone - 4.20	---	(462)H	---
	Fine Grained - 2.37	---	(285)H	---

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 120 pcf for cohesive soils and 110 pcf for open graded crushed stone.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve “Unsaturated” conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. “Submerged” conditions are recommended

### Lateral Earth Pressure Design Parameters

Earth Pressure Condition <sup>1</sup>	Coefficient for Backfill Type <sup>2</sup>	Surcharge Pressure <sup>3</sup> p <sub>1</sub> (psf)	Equivalent Fluid Pressures (psf) <sup>2,4</sup>	
			Unsaturated <sup>5</sup>	Submerged <sup>5</sup>

when water cannot be evacuated from behind the walls using positive drainage or a permanent sump pump.

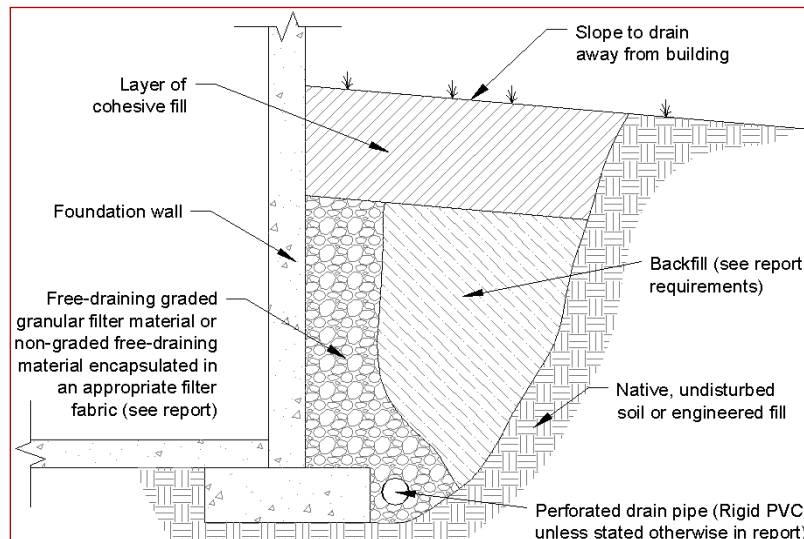
Backfill placed against structures should consist of open-graded crushed stone or low plasticity cohesive soils. For the crushed stone values to be valid, the stone backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case.

Footings, floor slabs or other loads bearing on backfill behind walls may have a significant influence on the lateral earth pressure. Placing footings within wall backfill and in the zone of active soil influence on the wall should be avoided unless structural analyses indicate the wall can safely withstand the increased pressure.

The lateral earth pressure recommendations given in this section are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls (also termed MSE walls) or temporary shoring systems. Recommendations covering these types of wall systems are beyond the scope of services for this assignment.

### Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as ALDOT No. 57 stone. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a prefabricated drainage structure may be used. A prefabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

The use of a permanent dewatering system is recommended to control long term hydrostatic uplift and lateral pressures beneath and around the below-grade walls. Typically, this system would consist of a retaining wall drainage layer and piping network which drains discharges by positive drainage or one or more permanent sump pumps. The permanent sump pump(s) should include an emergency backup generator, and redundant pumps should also be considered.

## General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner

is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.



## Geotechnical Engineering Report

Pell City Fire Station No. 2 | Pell City, Alabama

May 7, 2024 | Terracon Project No. E1235176

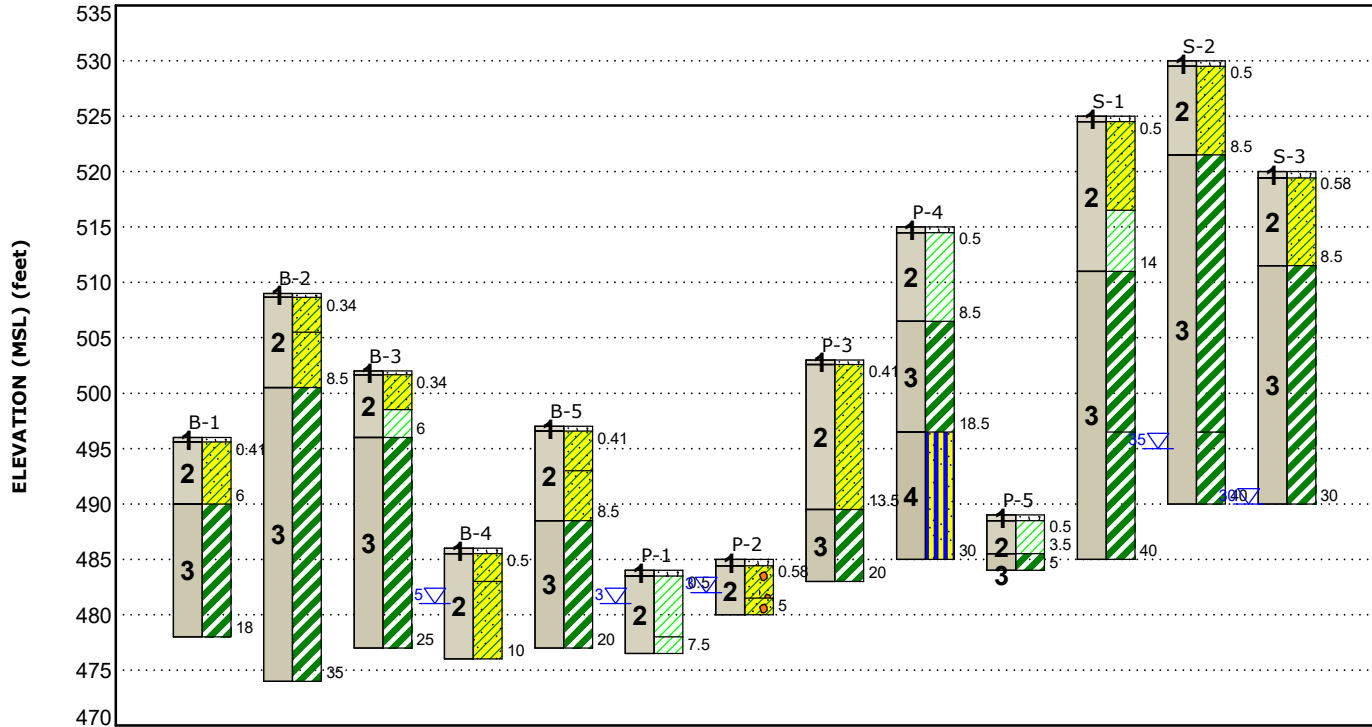


# Figures

## Contents:

GeoModel

## GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description	Legend	
1	<b>Topsoil</b>	Topsoil (4" to 7" at boring locations)	Topsoil	Sandy Lean Clay
2	<b>Lean Clay</b>	Lean Clay and Sandy Lean Clay with varying amounts of sand and gravel, soft upper layer encountered in B-3, B-4, B-5, P-1, P-2 and P-5	Fat Clay	Lean Clay
3	<b>Fat Clay</b>	Fat Clay with varying amounts of gravel, generally stiff to very stiff.	Sandy Lean Clay with Gravel	Sandy Silt
4	<b>Sandy Silt</b>	Sandy Silt, stiff to very stiff		

First Water Observation

**NOTES:**

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.  
 Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

**Geotechnical Engineering Report**

Pell City Fire Station No. 2 | Pell City, Alabama

May 7, 2024 | Terracon Project No. E1235176



## Attachments

# Exploration and Testing Procedures

## Field Exploration

### Exploration Point Layout and Elevations:

Number of Borings	Approximate Boring Depth (feet)	Location
5	10 to 35 feet	Planned building
5	5 to 30 feet	Planned parking and drives
3	30 to 40 feet	Potential cut slopes

**Exploration Point Layout and Elevations:** Terracon personnel provided the boring layout in the field using handheld GPS equipment (estimated horizontal accuracy of about  $\pm 20$  feet) and referencing existing site features. Approximate ground surface elevations were estimate from the furnished topographic map.

**Subsurface Exploration Procedures:** We advanced the borings with an ATV-mounted, rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

## Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Atterberg Limits
- Sieve Analysis
- Standard Proctor
- California Bearing Ratio

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

## Seismic Class Survey

We used a seismic refraction system consisting of a seismograph and 24 geophones to perform a seismic class survey for two locations designated as Array 1 and Array 2 as indicated on the [Exploration Plan](#). Two linear arrays of 24 geophones were placed in each of the two site locations oriented in a roughly north south direction and in a roughly west east direction as shown.

Microtremors produced by ambient seismic noise were recorded. The data was then processed using a wavefield-transformation data-processing technique and an interactive Rayleigh-wave dispersion-modeling tool. The refraction microtremor method exploits aspects of spectral analysis of surface waves (SASW) and multi-channel analysis of surface waves (MASW) to derive a shear wave profile and an average shear-wave velocity along the array for a corresponding depth of about 100 feet.

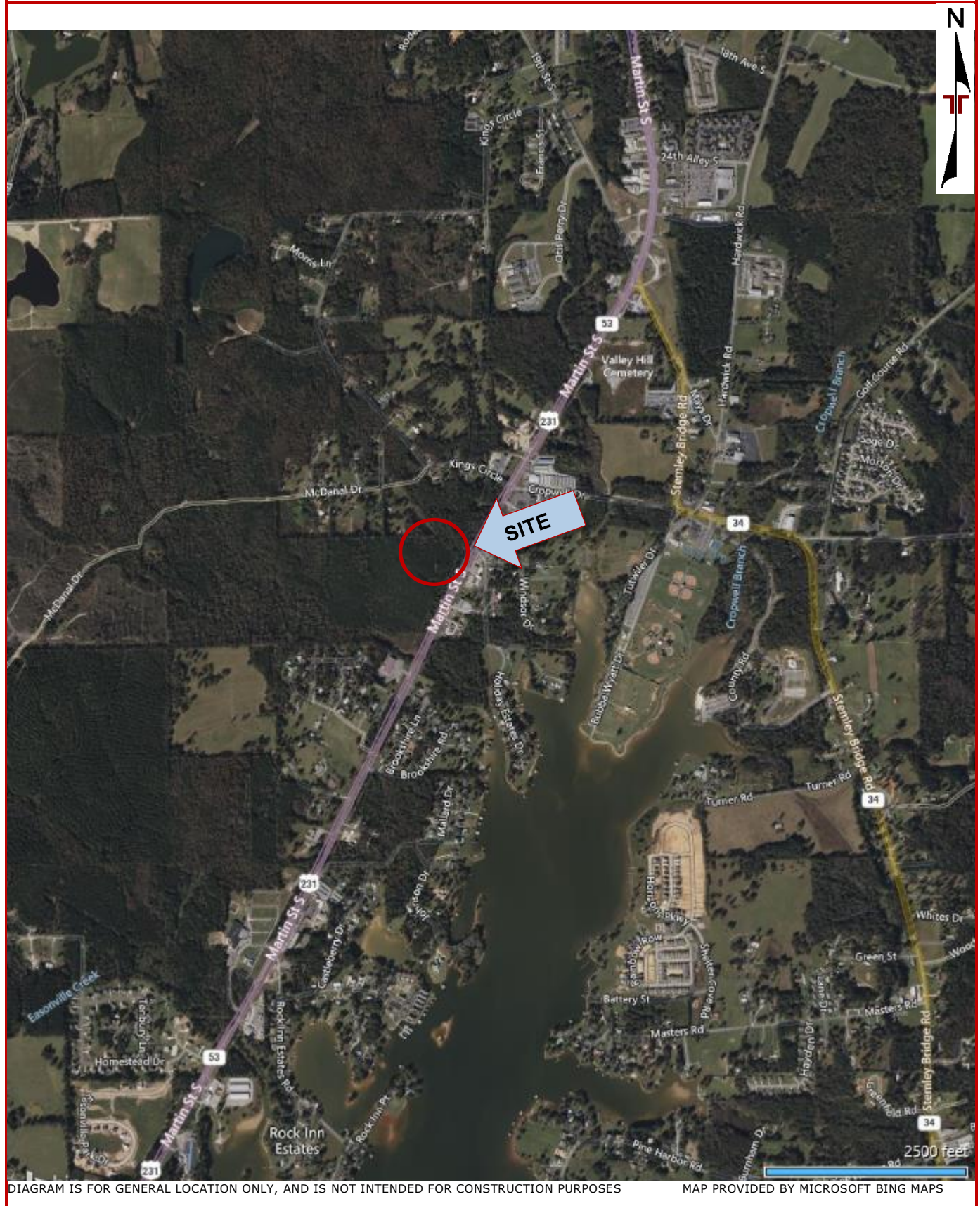
# Site Location and Exploration Plans

## **Contents:**

Site Location  
Exploration Plan

Note: All attachments are one page unless noted above.

## Site Location





## Exploration Plan

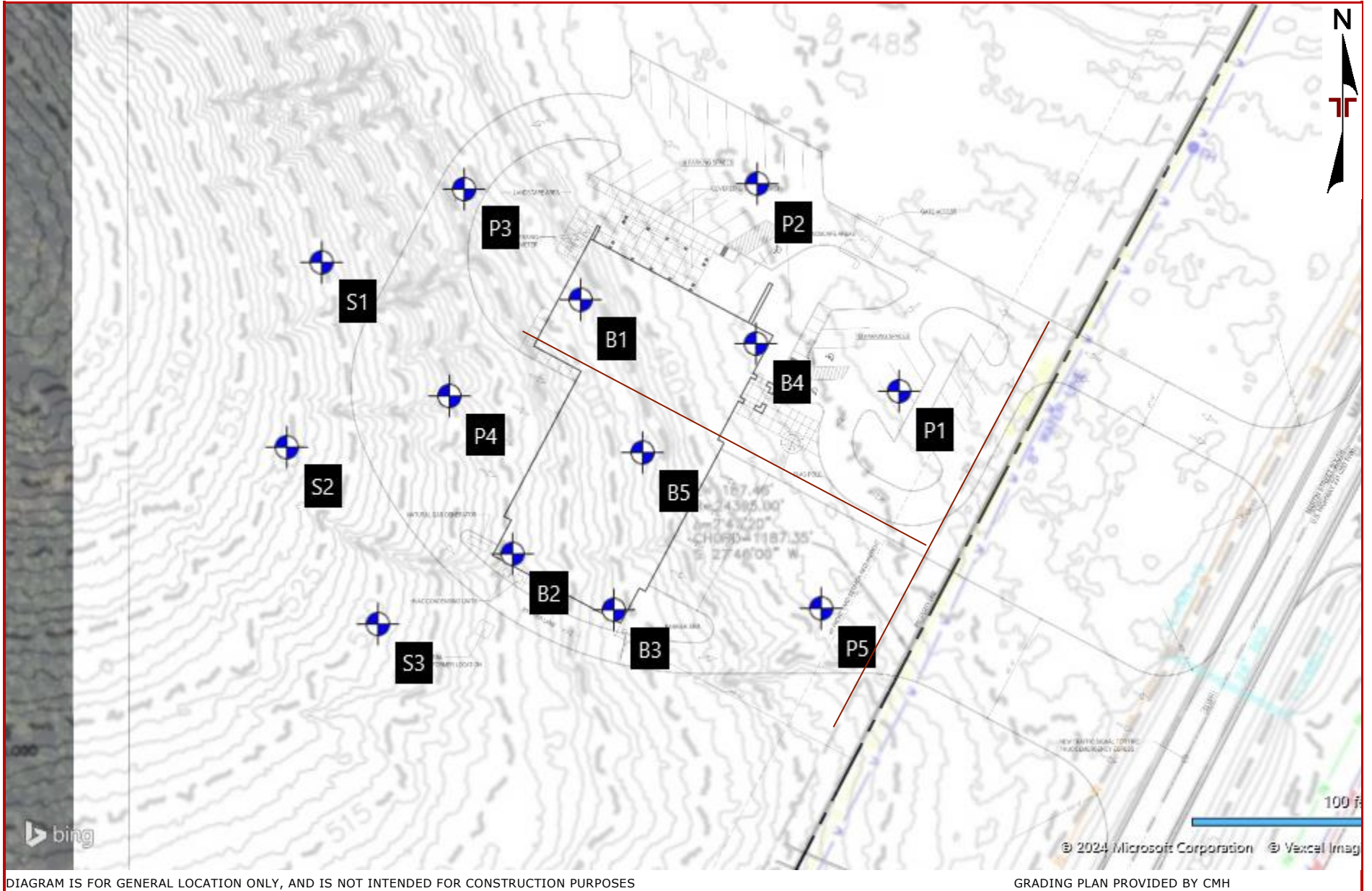


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

GRADING PLAN PROVIDED BY CMH



# Exploration and Laboratory Results

## **Contents:**

Boring Logs (B-1 to B-5; P-1 to P-5; S-1 to S-3)

MASW Shear Wave Velocity Profiles

- North-South Array
- East-West Array

Note: All attachments are one page unless noted above.

## Boring Log No. B-1

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.4	0.4	495.59						
		<b>TOPSOIL (5")</b>								
2		<b>SANDY LEAN CLAY (CL)</b> , reddish brown, medium stiff					3-3-3 N=6	17.0		
		with yellow brown, very stiff					7-10-12 N=22	24.4		
		6.0	6.0	490						
3		<b>FAT CLAY (CH)</b> , trace weathered rock fragments, reddish and yellowish brown, stiff					5-8-7 N=15	23.9	52-25-27	
							5-6-8 N=14	36.3		
							5-5-7 N=12			
		18.0	18.0	478						
		<b>Auger Refusal at 18 Feet</b>								

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**  
 Water not observed during drilling

**Drill Rig**  
 Diedrich D-50

**Driller**  
 Earth Core

**Notes**

**Advancement Method**  
 Hollow stem auger

**Logged by**  
 SWW

**Abandonment Method**  
 Boring backfilled with auger cuttings upon completion.

**Boring Started**  
 04-16-2024  
**Boring Completed**  
 04-16-2024

## Boring Log No. B-2

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.3	508.66							
		<b>TOPSOIL (4")</b> <b>SANDY LEAN CLAY (CL)</b> , reddish brown, stiff					3-6-8 N=14			
2		3.5	505.5							
		<b>SANDY LEAN CLAY (CL)</b> , trace weathered rock fragments, dark tan, stiff					4-4-8 N=12			
							6-6-8 N=14			
3		8.5	500.5							
		<b>FAT CLAY (CH)</b> , trace weathered rock fragments, tan and yellow with gray and red mottling, stiff					6-6-8 N=14			
		very stiff					6-7-12 N=19			
		some dark gray, stiff					3-4-5 N=9			
							4-4-6 N=10			
							3-3-5 N=8			
		becomes dark tan					3-6-7 N=13			
		35.0	474							
<b>Boring Terminated at 35 Feet</b>										

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**  
 Water not observed during drilling

**Drill Rig**  
 Geoprobe

**Notes**

**Advancement Method**  
 Hollow stem auger

**Driller**  
 Earth Core

**Abandonment Method**  
 Boring backfilled with auger cuttings upon completion.

**Logged by**  
 CMR

**Boring Started**  
 04-22-2024

**Boring Completed**  
 04-22-2024

## Boring Log No. B-3

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation.: 502 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1			0.3	501.66						
		<b>TOPSOIL (4")</b>								
		<b>SANDY LEAN CLAY (CL)</b> , trace weathered rock fragments, reddish brown, soft			X		2-2-2 N=4			
2			3.5	498.5						
		<b>LEAN CLAY (CL)</b> , trace rootlets, dark tan, soft to medium stiff			X		2-2-3 N=5			
			6.0	496						
		<b>FAT CLAY (CH)</b> , dark tan with gray and yellow mottling, very stiff			X		6-7-8 N=15			
					X		8-8-13 N=21			
					X		15-13-10 N=23			
3										
		trace weathered rock fragments, some black			X		6-8-12 N=20			
			25.0	477						
		<b>Boring Terminated at 25 Feet</b>			X		3-8-10 N=18			

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b> Water not observed during drilling</p>	<p><b>Drill Rig</b> Geoprobe</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b> Hollow stem auger</p>	<p><b>Driller</b> Earth Core</p>
	<p><b>Abandonment Method</b> Boring backfilled with auger cuttings upon completion.</p>	<p><b>Logged by</b> CMR</p> <p><b>Boring Started</b> 04-22-2024</p> <p><b>Boring Completed</b> 04-22-2024</p>

## Boring Log No. B-4

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation: (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1	0.5	<b>TOPSOIL (6")</b>	0.5	485.5						
	3.0	<b>SANDY LEAN CLAY (CL)</b> , light brown, very soft	3.0	483			WOH	23.3		
2	10.0	<b>SANDY LEAN CLAY (CL)</b> , with weathered rock fragments, light gray and red, hard  very stiff  trace black	10.0	476	▽		9-50/3" N=50+			
							9-11-18 N=29	24.0		
							9-12-16 N=28			
<b>Boring Terminated at 10 Feet</b>			10							

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**  
 ▽ Water observed at 5' during drilling

**Drill Rig**  
 Diedrich D-50

**Driller**  
 Earth Core

**Notes**

**Advancement Method**  
 Hollow stem auger

**Logged by**  
 SWW

**Abandonment Method**  
 Boring backfilled with auger cuttings upon completion.

**Boring Started**  
 04-16-2024  
**Boring Completed**  
 04-16-2024

## Boring Log No. B-5

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation: (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1	TOPSOIL (5")		0.4	496.59			1-2-3 N=5	17.2		
	SANDY LEAN CLAY	yellowish brown, soft to medium stiff								
2	SANDY LEAN CLAY (CL)	yellowish brown, some black, stiff	4.0	493			2-4-6 N=10			
	very stiff									
	FAT CLAY (CH)	light gray/tan/red, very stiff	8.5	488.5			7-11-14 N=25	17.3	47-19-28	
	with trace gravel									
3	mostly light brown		20.0	477			10-12-16 N=28			
	Boring Terminated at 20 Feet						7-7-10 N=17	24.3		
	6-7-10						6-7-10 N=17			



<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b>                  Water not observed during drilling</p>	<p><b>Drill Rig</b>                  Diedrich D-50</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b>                  Hollow stem auger</p>	<p><b>Driller</b>                  Earth Core</p>
	<p><b>Abandonment Method</b>                  Boring backfilled with auger cuttings upon completion.</p>	<p><b>Logged by</b>                  SWW</p> <p><b>Boring Started</b>                  04-16-2024</p> <p><b>Boring Completed</b>                  04-16-2024</p>


## Boring Log No. P-1

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation.: 484 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.5		483.5						
		<b>TOPSOIL (6")</b>								
2		<b>LEAN CLAY (CL)</b> , with trace gravel, grayish brown, very soft			▽		WOH	27.4		
							1-0-1 N=1			
		6.0		478						
		<b>LEAN CLAY (CL)</b> , with trace gravel, grayish brown, very stiff					4-10-13 N=23			
		7.5		476.5						
<b>Boring Terminated at 7.5 Feet</b>										

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b>   Water observed at 3' during drilling</p>	<p><b>Drill Rig</b> Diedrich D-50</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b> Hollow stem auger</p> <p><b>Abandonment Method</b> Boring backfilled with auger cuttings upon completion.</p>	<p><b>Driller</b> Earth Core</p> <p><b>Logged by</b> SWW</p> <p><b>Boring Started</b> 04-16-2024</p> <p><b>Boring Completed</b> 04-16-2024</p>

## Boring Log No. P-2

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation.: 485 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.6 <b>TOPSOIL (7")</b>		484.42						
2		3.5 <b>SANDY LEAN CLAY WITH GRAVEL (CL)</b> , brown, very soft		481.5	▽		WOH	21.6		
		5.0 <b>SANDY LEAN CLAY WITH GRAVEL (CL)</b> , red and orange, very stiff		480			9-15-12 N=27			
<b>Boring Terminated at 5 Feet</b>										

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).</p> <p>See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b>   Water observed at 3' during drilling</p>	<p><b>Drill Rig</b> Diedrich D-50</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b> Hollow stem auger</p> <p><b>Abandonment Method</b> Boring backfilled with auger cuttings upon completion.</p>	<p><b>Driller</b> Earth Core</p> <p><b>Logged by</b> SWW</p> <p><b>Boring Started</b> 04-16-2024</p> <p><b>Boring Completed</b> 04-16-2024</p>



## Boring Log No. P-3

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation.: 503 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1	TOPSOIL (5")		0.4	502.59						
2	SANDY LEAN CLAY (CL), with trace gravel, yellowish brown, stiff  becomes very stiff  with red						6-7-8 N=15	21.8		
						5-12-18 N=30				
							8-12-16 N=28	21.9		
							6-7-14 N=21			
3	FAT CLAY (CH), with trace gravel, reddish brown and yellow, very stiff		13.5	489.5			9-13-17 N=30	22.7		
			20.0	483			3-5-7 N=12	40.9		
		<b>Boring Terminated at 20 Feet</b>								

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b>                  Water not observed during drilling</p>	<p><b>Drill Rig</b>                  Diedrich D-50</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b>                  Hollow stem auger</p>	<p><b>Driller</b>                  Earth Core</p>
	<p><b>Abandonment Method</b>                  Boring backfilled with auger cuttings upon completion.</p>	<p><b>Logged by</b>                  SWW</p> <p><b>Boring Started</b>                  04-16-2024</p> <p><b>Boring Completed</b>                  04-16-2024</p>

## Boring Log No. P-4

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation: (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		<b>TOPSOIL (6")</b>	0.5	514.5						
2		<b>LEAN CLAY (CL)</b> , yellowish red, stiff  with tan, very stiff	8.5	506.5			4-5-6 N=11  5-7-8 N=15  8-8-10 N=18	21.0  29.4		
3		<b>FAT CLAY (CH)</b> , yellowish red, very stiff  with trace gravel	18.5	496.5			8-12-15 N=27  8-11-16 N=27			
4		<b>SANDY SILT (ML)</b> , tan and dark gray, very stiff  stiff to very stiff  very stiff, minimal recovery	30.0	485			8-12-14 N=26  6-7-8 N=15  5-8-12 N=20	29.3	38-29-9	63
<b>Boring Terminated at 30 Feet</b>										

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**  
 Water not observed during drilling

**Drill Rig**  
 Diedrich D-50

**Driller**  
 Earth Core

**Notes**

**Advancement Method**  
 Hollow stem auger

**Logged by**  
 SWW

**Abandonment Method**  
 Boring backfilled with auger cuttings upon completion.

**Boring Started**  
 04-16-2024  
**Boring Completed**  
 04-16-2024

## Boring Log No. P-5

Model Layer	Graphic Log	Location: See <a href="#">Exploration Plan</a>	Depth (Ft.)	Elevation.: 489 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.5		488.5						
2		<b>LEAN CLAY (CL)</b> , red brown, soft to medium stiff					2-2-3 N=5			
3		<b>FAT CLAY (CH)</b> , red brown and tan, very stiff		485.5			9-11-13 N=24			
		<b>Boring Terminated at 5 Feet</b>								

<p>See <a href="#">Exploration and Testing Procedures</a> for a description of field and laboratory procedures used and additional data (If any).                  See <a href="#">Supporting Information</a> for explanation of symbols and abbreviations.</p>	<p><b>Water Level Observations</b>                  Water not observed during drilling</p>	<p><b>Drill Rig</b>                  Diedrich D-50</p>
<p><b>Notes</b></p>	<p><b>Advancement Method</b>                  Hollow stem auger</p> <p><b>Abandonment Method</b>                  Boring backfilled with auger cuttings upon completion.</p>	<p><b>Driller</b>                  Earth Core</p> <p><b>Logged by</b>                  SWW</p> <p><b>Boring Started</b>                  04-16-2024</p> <p><b>Boring Completed</b>                  04-16-2024</p>

## Boring Log No. S-1

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation: (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
										LL-PL-PI	Percent Fines
1	TOPSOIL (6")		0.5	524.5							
2	SANDY LEAN CLAY (CL), red and tan, very stiff	hard			5			5-9-12 N=21	15.9		
							8-12-20 N=32	19.3			
							10-15-25 N=40	19.8			
	LEAN CLAY (CL), yellowish brown and white, very stiff		8.5	516.5							
3	FAT CLAY (CH), brown, tan and red, hard, trace gravel	mostly tan and yellow, very stiff			10			12-13-17 N=30	18.2		
							12-15-21 N=36	24.4			
							10-16-18 N=34				
							8-12-18 N=30				
							6-6-8 N=14				
	FAT CLAY (CH), tan to red, stiff		28.5	496.5							
	FAT CLAY (CH), tan to red, stiff	very stiff			30			7-9-12 N=21			
						5-10-12 N=22					
	FAT CLAY (CH), tan to red, stiff		40.0	485	40						
<b>Boring Terminated at 40 Feet</b>											

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**  
 Water not observed during drilling

**Drill Rig**  
 Diedrich D-50

**Driller**  
 Earth Core

**Notes**

**Advancement Method**  
 Hollow stem auger

**Logged by**  
 SWW

**Abandonment Method**  
 Boring backfilled with auger cuttings upon completion.

**Boring Started**  
 04-16-2024  
**Boring Completed**  
 04-16-2024

## Boring Log No. S-2

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation: 530 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
										LL-PL-PI	Percent Fines
1		<b>TOPSOIL (6")</b>	0.5	529.5							
2		<b>SANDY LEAN CLAY (CL)</b> , reddish brown, stiff to very stiff  with yellow, trace gravel			5			3-7-8 N=15	18.6		
								5-11-15 N=26	18.3		
								8-10-13 N=23	21.5		
			8.5	521.5				7-9-13 N=22	26.3		
3		<b>FAT CLAY (CH)</b> , reddish brown and tan, very stiff to hard, mottled, with rock fragments			10						
								10-12-18 N=30	19.9		
								9-14-20 N=34			
								6-12-19 N=31			
								6-10-15 N=25			
			33.5	496.5				6-10-13 N=23			
		<b>FAT CLAY (CH)</b> , brown to light brown, stiff to very stiff			35	▽					
								4-4-6 N=10			
		<b>Boring Terminated at 40 Feet</b>	40.0	490	40						

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**

▽ Water observed at 35' during drilling

**Drill Rig**  
Diedrich D-50

**Driller**  
Earth Core

**Notes**

**Advancement Method**  
Hollow stem auger

**Logged by**  
SWW

**Abandonment Method**  
Boring backfilled with auger cuttings upon completion.

**Boring Started**  
04-12-2024  
**Boring Completed**  
04-12-2024

## Boring Log No. S-3

Model Layer	Graphic Log	Location: See Exploration Plan	Depth (Ft.)	Elevation.: 520 (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits	
									LL-PL-PI	Percent Fines
1		0.6 <b>TOPSOIL (7")</b>		519.42						
2		<b>SANDY LEAN CLAY (CL)</b> , trace gravel, red, medium stiff  with tan and white, hard, with weathered rock fragments					3-3-4 N=7			
							7-19-50/4" N=50+	20.3		
							7-16-28 N=44	21.6		
		8.5		511.5			11-15-22 N=37	21.0		
3		<b>FAT CLAY (CH)</b> , with weathered rock fragments, reddish brown and tan, hard  some black mottling  becomes very stiff					8-14-22 N=36	22.5		
							5-6-11 N=17	21.0		
							3-7-10 N=17			
							4-10-11 N=21			
		30.0		490						
		<b>Boring Terminated at 30 Feet</b>								

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).  
 See [Supporting Information](#) for explanation of symbols and abbreviations.

**Water Level Observations**

Water observed at 30' during drilling

**Drill Rig**

Diedrich D-50

**Driller**

Earth Core

**Notes**

**Advancement Method**

Hollow stem auger

**Logged by**

SWW

**Abandonment Method**

Boring backfilled with auger cuttings upon completion.

**Boring Started**

04-12-2024

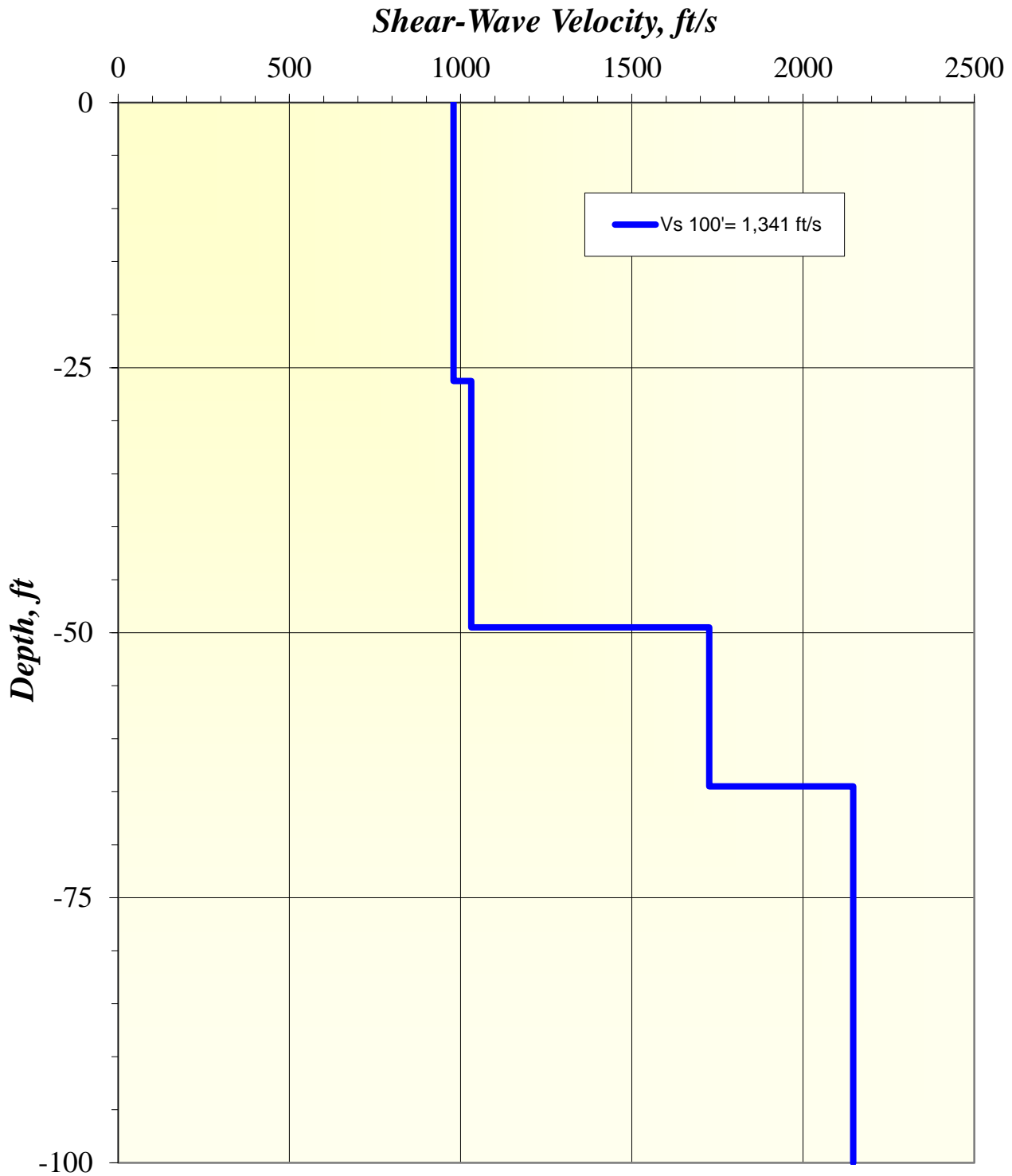
**Boring Completed**

04-12-2024

# Average Shear Wave Velocity Profile

Array 1  
Pell City Fire Station #2  
Martin Street S  
Pell City, St. Clair County, Alabama  
Terracon Project No. E1235176

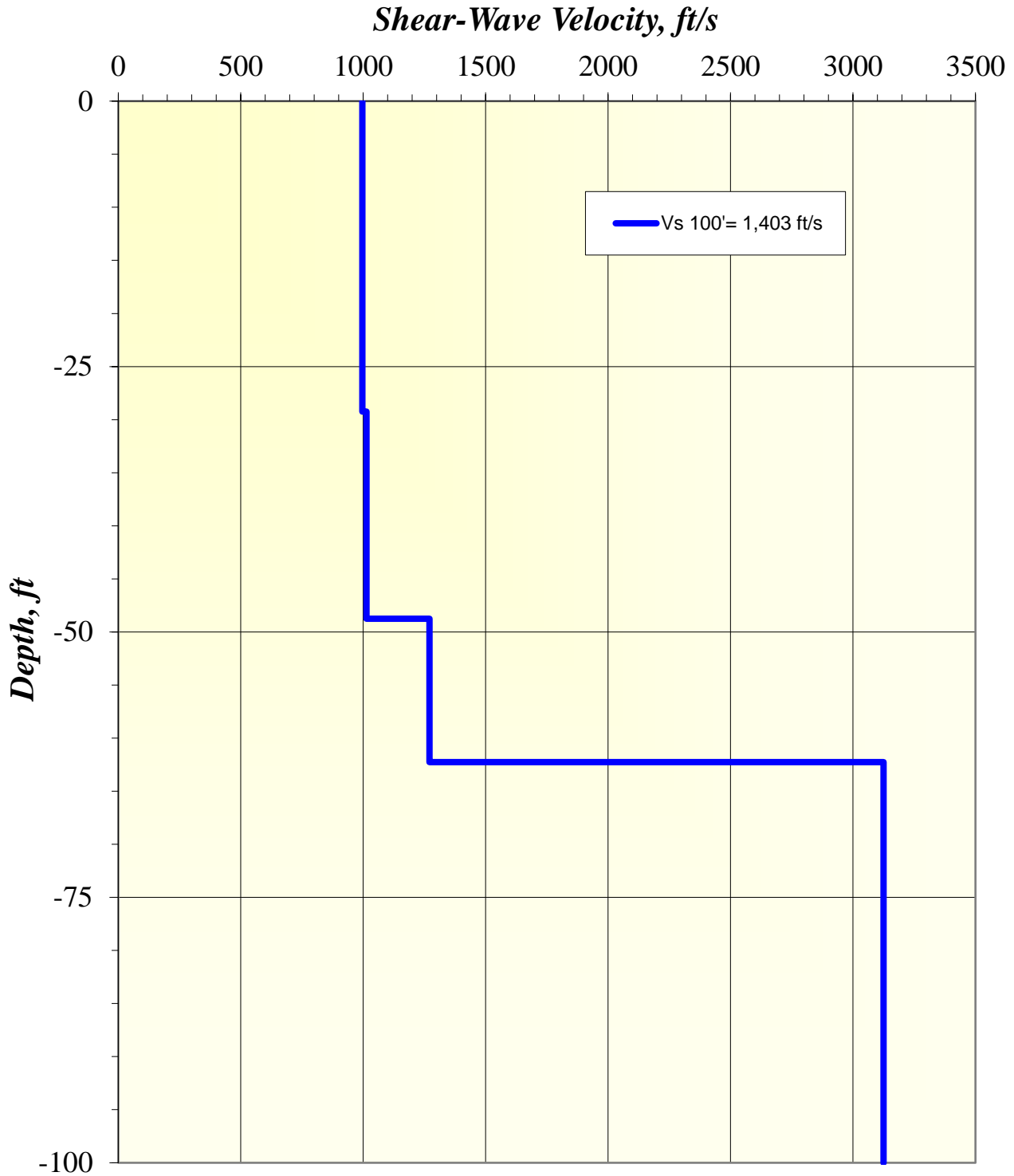
## *Vs Model*



# Average Shear Wave Velocity Profile

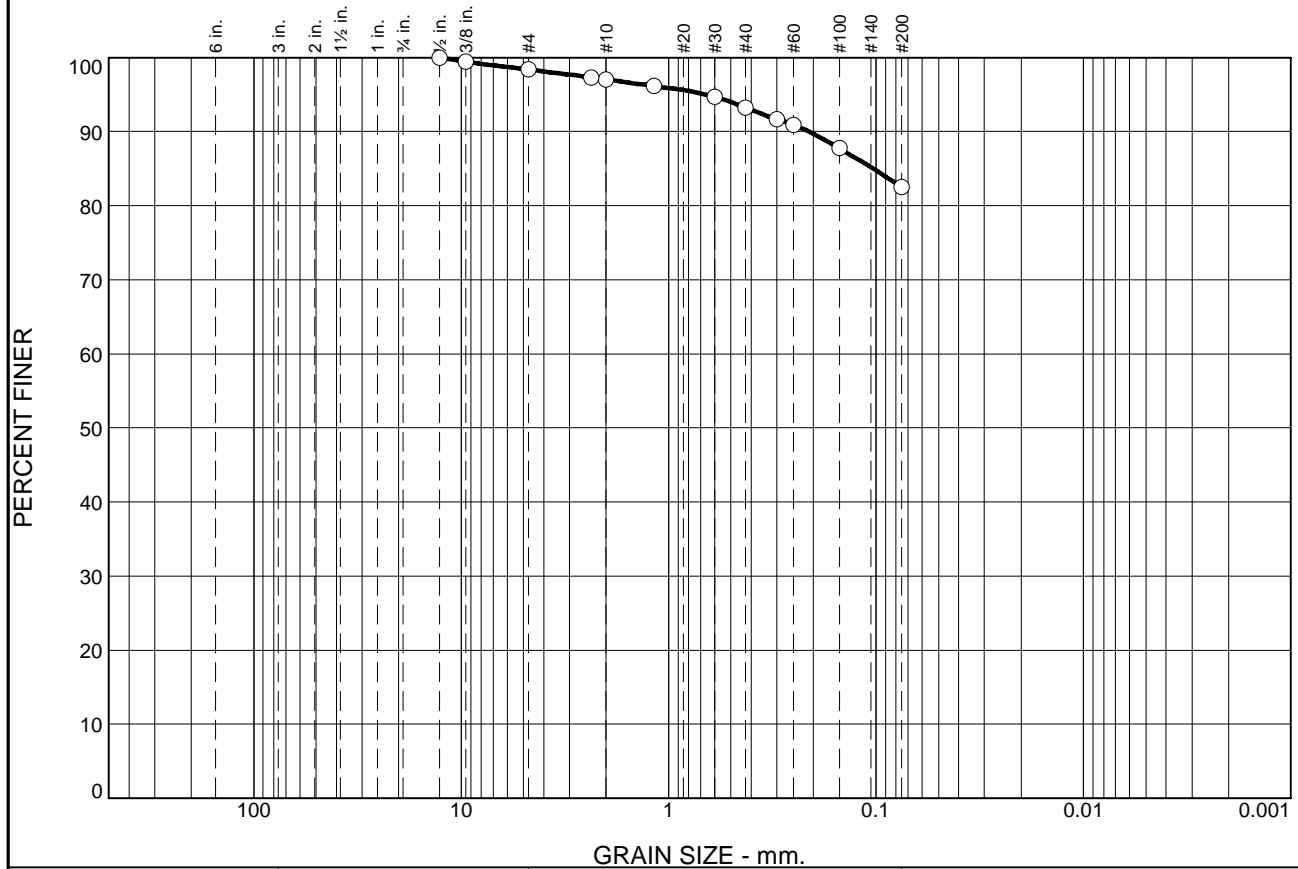
Array 2  
Pell City Fire Station #2  
Martin Street S  
Pell City, St. Clair County, Alabama  
Terracon Project No. E1235176

## *Vs Model*





# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	1.4	3.8	10.7	82.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5"	100.0		
.375"	99.4		
#4	98.4		
#8	97.3		
#10	97.0		
#16	96.1		
#30	94.7		
#40	93.2		
#50	91.6		
#60	90.9		
#100	87.7		
#200	82.5		

**Material Description**

PL= 22.6      **Atterberg Limits**      LL= 46.4      PI= 23.8

D<sub>90</sub>= 0.2105      **Coefficients**      D<sub>85</sub>= 0.1037      D<sub>60</sub>=

D<sub>50</sub>=      D<sub>30</sub>=

D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

USCS= CL      **Classification**      AASHTO= A-7-6(20)

**Remarks**

\* (no specification provided)

Source of Sample: Bulk      Depth: 7-13  
 Sample Number: P-4

Date: 4/22/24

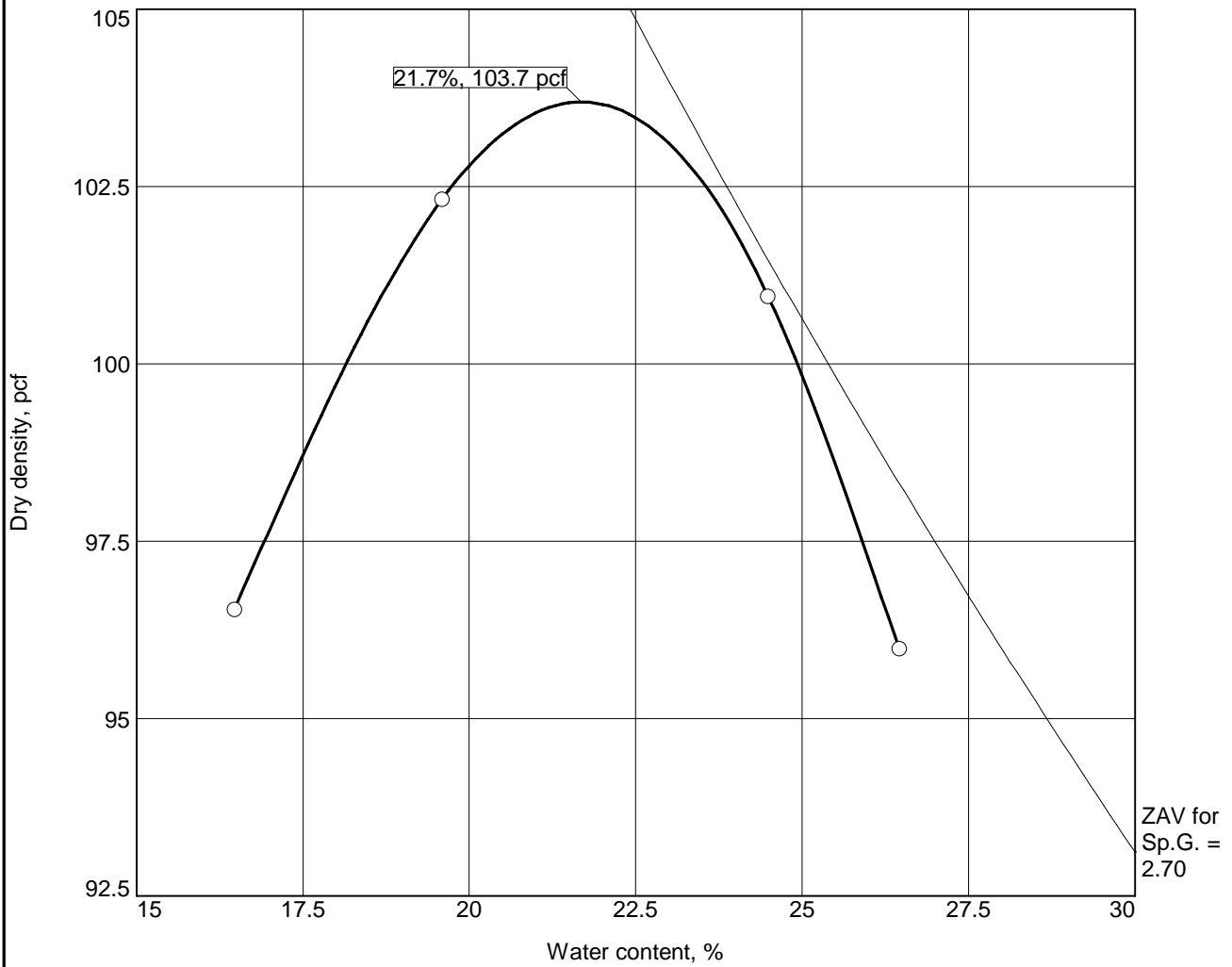
**Terracon Consultants, Inc.**  
 Birmingham, Alabama

Client:  
 Project: Pell City Fire Station  
 Project No: E1235176

Figure

Tested By: LW

# COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
7-13	CL	A-7-6(20)		2.7	46.4	23.8	0.6	82.5

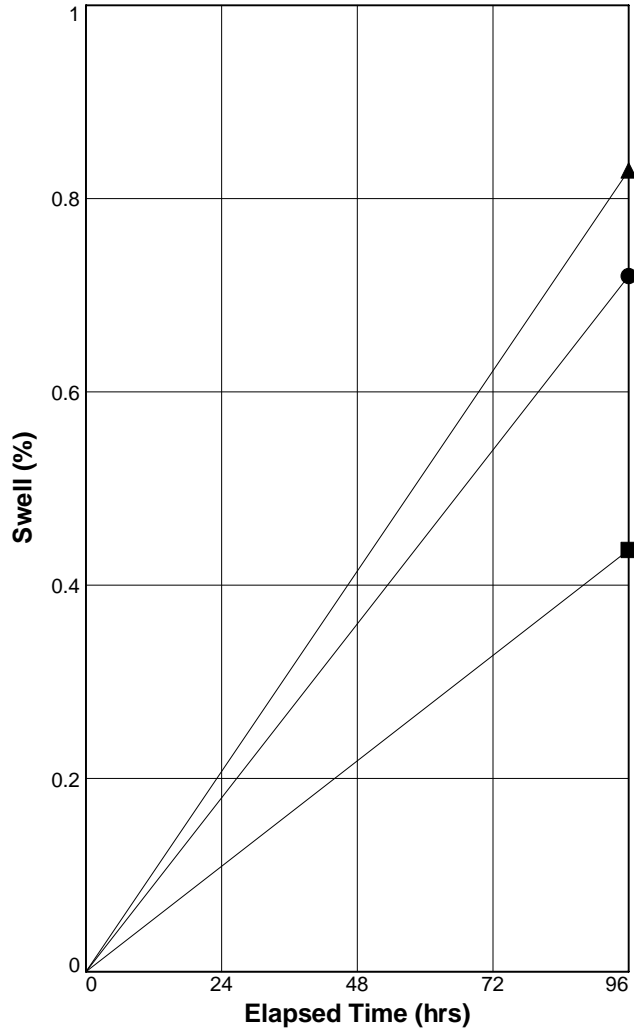
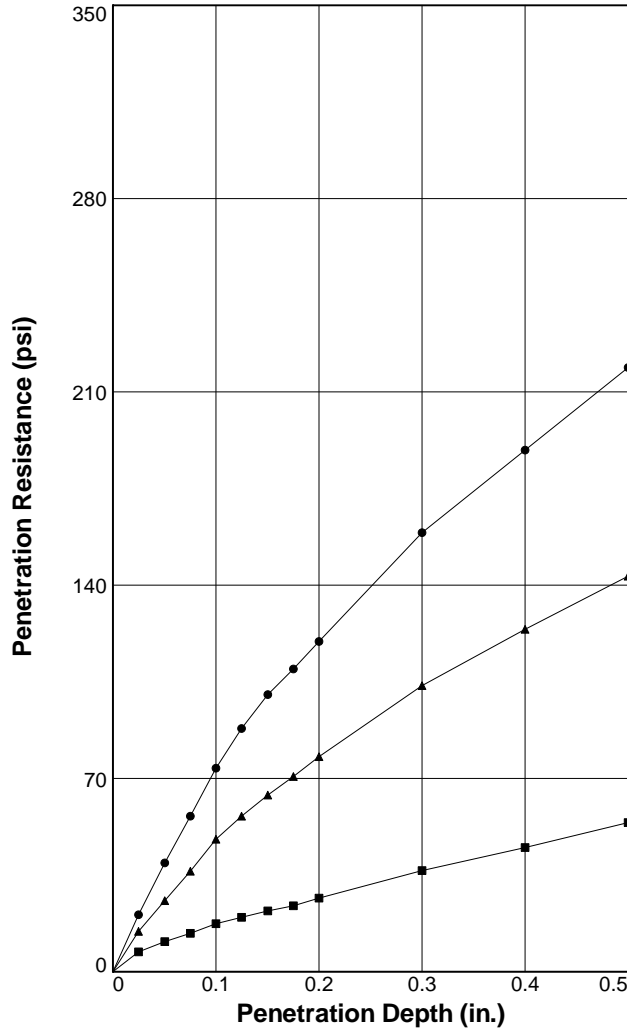
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.7 pcf Optimum moisture = 21.7 %	
<b>Project No.</b> E1235176 <b>Client:</b> <b>Project:</b> Pell City Fire Station  ○ <b>Source of Sample:</b> Bulk <b>Sample Number:</b> P-4 <b>Terracon Consultants, Inc.</b>  <b>Birmingham, Alabama</b>	<b>Remarks:</b>

Figure

**Tested By:** LW

# BEARING RATIO TEST REPORT

## ASTM D1883-16



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	101.8	98.2	19.7	101.1	97.5	21.0	7.4	8.0	0.000	10	0.7
2 △	101.8	98.2	21.6	100.9	97.3	22.7	4.8	5.2	0.000	10	0.8
3 □	101.9	98.3	23.6	101.4	97.8	24.3	1.7	1.8	0.000	10	0.4
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
							CL	103.7	21.7	46.4	23.8

**Project No:** E1235176  
**Project:** Pell City Fire Station  
**Source of Sample:** Bulk      **Depth:** 7-13  
**Sample Number:** P-4  
**Date:** 4/22/24

**Test Description/Remarks:**

## **Supporting Information**






### **Contents:**

General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

## General Notes

Sampling	Water Level	Field Tests
 Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered  Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

### Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

### Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

### Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

### Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

## Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification	
				Group Symbol	Group Name <sup>B</sup>
<b>Coarse-Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	$Cu < 4$ and/or $[Cc < 1$ or $Cc > 3.0]$ <sup>E</sup>	GP	Poorly graded gravel <sup>F</sup>
			Fines classify as ML or MH	GM	Silty gravel <sup>F, G, H</sup>
		<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	Fines classify as CL or CH	GC
	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>			SW	Well-graded sand <sup>I</sup>
	<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>		$Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$ <sup>E</sup>	SP	Poorly graded sand <sup>I</sup>
			Fines classify as ML or MH	SM	Silty sand <sup>G, H, I</sup>
	<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	PI > 7 and plots above "A" line <sup>J</sup>	CL
PI < 4 or plots below "A" line <sup>J</sup>				ML	Silt <sup>K, L, M</sup>
<b>Organic:</b>			$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OL	Organic clay <sup>K, L, M, N</sup> Organic silt <sup>K, L, M, O</sup>
			<b>Silts and Clays:</b> Liquid limit 50 or more	<b>Inorganic:</b>	PI plots on or above "A" line
PI plots below "A" line		MH			Elastic silt <sup>K, L, M</sup>
<b>Organic:</b>		$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$		OH	Organic clay <sup>K, L, M, P</sup> Organic silt <sup>K, L, M, Q</sup>
		<b>Highly organic soils:</b>		Primarily organic matter, dark in color, and organic odor	

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

<sup>E</sup>  $Cu = D_{60}/D_{10}$      $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

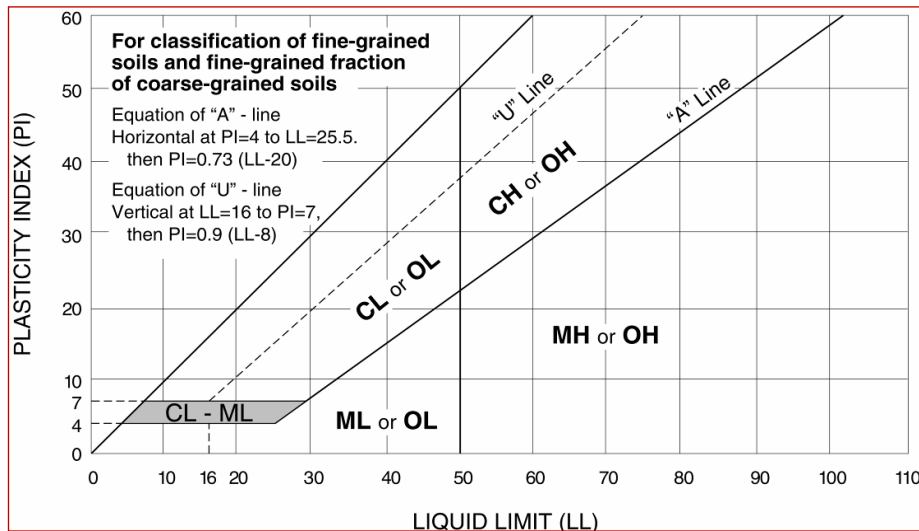
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup> PI < 4 or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

<sup>Q</sup> PI plots below "A" line.



**SECTION 03 3000 - CAST-IN-PLACE CONCRETE****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Foundations.
  - 2. Slabs-on-grade.
  - 3. Suspended slabs on metal deck.
- B. Related Sections:
  - 1. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.
  - 2. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

**1.03 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

**1.04 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
  - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - 1. Location of construction joints is subject to approval of the Architect.
- F. Samples: For waterstops vapor retarder.

**1.05 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer manufacturer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Steel reinforcement and accessories.

5. Waterstops.
  6. Curing compounds.
  7. Floor and slab treatments.
  8. Bonding agents.
  9. Adhesives.
  10. Vapor retarders.
  11. Semirigid joint filler.
  12. Joint-filler strips.
  13. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site <Insert location>.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.



- c. Ready-mix concrete manufacturer.
  - d. Concrete subcontractor.
  - e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

### PART 2 PRODUCTS

#### 2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  1. Plywood, metal, or other approved panel materials.
  2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.
    - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    - c. Structural 1, B-B or better; mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
  3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## 2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.03 REINFORCEMENT ACCESSORIES

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

## 2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150 gray, Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F or C.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

## 2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Non-Set-Accelerating Corrosion-Inhibiting Admixture: All exposed concrete shall contain a commercially formulated, non-set accelerating, amine carboxylate based, mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Product should meet ASTM C1582. Product should have certification to meet NSF Standard 61 (FDNP.MH25692 Drinking Water System Components).
  - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cortec Corporation: 2005
    - b. Cortec Corporation: 2005NS
    - c. Equivalent products are acceptable pending review and approval by the Engineer of Record.

## 2.06 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Monofilament Micro-Fibers:
    - 1) Axim Italcementi Group, Inc.; Fibrasol II P.
    - 2) Euclid Chemical Company (The), an RPM company; Fiberstrand 100.
    - 3) FORTA Corporation; FORTA Econo-Mono.
    - 4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
    - 5) Metalcrete Industries; Polystrand 1000.
    - 6) Nycon, Inc.; ProConM.
    - 7) Propex Concrete Systems Corp.; Fibermesh 150.
    - 8) Sika Corporation; Sika Fiber PPM.
  - b. Fibrillated Micro-Fibers:
    - 1) Axim Italcementi Group, Inc.; Fibrasol F.
    - 2) Euclid Chemical Company (The), an RPM company; Fiberstrand F.
    - 3) FORTA Corporation; FORTA Econo-Net.
    - 4) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
    - 5) Nycon, Inc.; ProConF.
    - 6) Propex Concrete Systems Corp.; Fibermesh 300.
    - 7) Sika Corporation; Sika Fiber PPF.

## 2.07 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Greenstreak.
    - b. Williams Products, Inc.
  2. Profile: Flat, dumbbell with center bulb.

## 2.08 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, Include manufacturer's recommended adhesive or pressure-sensitive tape.
  1. Products:
    - a. Fortifiber Building Systems Group; Moistop Ultra 15.
    - b. Raven Industries Inc.; Vapor Block 15.
    - c. Reef Industries, Inc.; Griffolyn Type-105 Type-65G 15 mil Green.
    - d. Stego Industries, LLC; Stego Wrap 15 mil Class A 10 mil Class A.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

## 2.09 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  1. Products:
    - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
    - b. BASF Construction Chemicals - Building Systems; Confilm.

- c. ChemMasters; SprayFilm.
  - d. Conspec by Dayton Superior; Aquafilm.
  - e. Dayton Superior Corporation; Sure Film (J-74).
  - f. Edoco by Dayton Superior; BurkeFilm.
  - g. Euclid Chemical Company (The), an RPM company; Eucobar.
  - h. Kaufman Products, Inc.; Vapor-Aid.
  - i. Lambert Corporation; LAMBCO Skin.
  - j. L&M Construction Chemicals, Inc.; E-CON.
  - k. Meadows, W. R., Inc.; EVAPRE.
  - l. Metalcrete Industries; Waterhold.
  - m. Nox-Crete Products Group; MONOFILM.
  - n. Sika Corporation; SikaFilm.
  - o. SpecChem, LLC; Spec Film.
  - p. Symons by Dayton Superior; Finishing Aid.
  - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
  - r. Unitex; PRO-FILM.
  - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- 1. Products:
    - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
    - b. BASF Construction Chemicals - Building Systems; Kure 200.
    - c. ChemMasters; Safe-Cure Clear.
    - d. Conspec by Dayton Superior; W.B. Resin Cure.
    - e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
    - f. Edoco by Dayton Superior; Res X Cure WB.
    - g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
    - h. Kaufman Products, Inc.; Thinfilm 420.
    - i. Lambert Corporation; AQUA KURE - CLEAR.
    - j. L&M Construction Chemicals, Inc.; L&M Cure R.
    - k. Meadows, W. R., Inc.; 1100-CLEAR.
    - l. Nox-Crete Products Group; Resin Cure E.
    - m. Right Pointe; Clear Water Resin.
    - n. SpecChem, LLC; Spec Rez Clear.
    - o. Symons by Dayton Superior; Resi-Chem Clear.
    - p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
    - q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- 1. Products:
    - a. Anti-Hydro International, Inc.; AH Clear Cure WB.
    - b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
    - c. ChemMasters; Safe-Cure & Seal 20.
    - d. Conspec by Dayton Superior; Cure and Seal WB.
    - e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
    - f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
    - g. Edoco by Dayton Superior; Spartan Cote WB II.

- h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
- i. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
- j. Lambert Corporation; Glazecote Sealer-20.
- k. L&M Construction Chemicals, Inc.; Dress & Seal WB.
- l. Meadows, W. R., Inc.; Vocomp-20.
- m. Metalcrete Industries; Metcure.
- n. Nox-Crete Products Group; Cure & Seal 150E.
- o. Symons by Dayton Superior; Cure & Seal 18 Percent E.
- p. TK Products, Division of Sierra Corporation; TK-2519 WB.
- q. Vexcon Chemicals, Inc.; Starseal 309.

#### 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

#### 2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

#### 2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Silica Fume: 10 percent.
  - 4. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.50.
  3. Slump Limit: for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture plus or minus 1 inch (25 mm).
  4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
- B. Concrete fill on Metal Deck: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
  2. Minimum Cementitious Materials Content: 520lb/cu. yd.
  3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
  4. Air Content: Do not allow air content of trowelled finished floors to exceed 3 percent.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
  2. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m).
  3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
  4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- D. Building Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.50.
  3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
  4. Air Content: 5.5 <Insert number> percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

## 2.14 FABRICATING REINFORCEMENT

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

## 2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 EXECUTION

### 3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
  - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  - 3. Install dovetail anchor slots in concrete structures as indicated.

### 3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.04 SHORES AND RESHORES

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

### 3.05 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

### 3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.07 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.



5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth <Insert depth> of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.08 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

### 3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces as directed by the Architect.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
  2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland

cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  1. Apply float finish to surfaces indicated.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  1. Apply a trowel finish to surfaces indicated.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    - b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
  1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
  1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

### 3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
  - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least one six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clear-

ance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
  1. Steel reinforcement placement.
  2. Steel reinforcement welding.
  3. Headed bolts and studs.
  4. Verification of use of required design mixture.
  5. Concrete placement, including conveying and depositing.
  6. Curing procedures and maintenance of curing temperature.
  7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
  6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  7. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

- b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
  9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
  11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

### 3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 3000

**SECTION 03 3511  
CONCRETE FLOOR FINISHES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface treatments for concrete floors and slabs.
- B. Clear coatings.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.
- B. Section 09 6500 - Resilient Flooring

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with concrete floor placement and concrete floor curing.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.
- D. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.05 MOCK-UP**

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 10 feet square.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

**1.07 FIELD CONDITIONS**

- A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- B. Do not finish floors until interior heating system is operational.
- C. Maintain ambient temperature of 50 degrees F minimum.

**1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.
- C. Finish Warranty: Provide five-year manufacturer warranty against excessive degradation of finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

**PART 2 PRODUCTS****2.01 COATINGS**



- A. Clear Coating: Clear coating recommended by manufacturer for finishing concrete floors and slabs. Marked CONC-1 on Finish Schedule.
  - 1. Gloss: Satin.
  - 2. Type: High solids epoxy; two-component.
    - a. Products:
      - 1) Sherwin Williams with H&C ArmorSeal 8100 with SharkGrip Slip-Resistant Additive.
      - 2) Substitutions: See Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

#### **3.02 GENERAL**

- A. Apply materials in accordance with manufacturer's instructions.

#### **3.03 COATING APPLICATION**

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.
- C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.
  - 1. First coat: 2.0 - 4.0 mils Armor 8100 (reduced with one pint of water per gallon).
  - 2. Second Coat: 2.0 - 4.0 mils ArmorSeal 8100.
  - 3. Third Coat: 2.0 - 4.0 mils Armor 8100 with 3.2 oz SharkGrip per Gallon.

#### **3.04 PROTECTION**

- A. Protect finished floors from traffic as recommended by manufacturer of coating system.

**END OF SECTION**

**SECTION 03 3533  
STAMPED CONCRETE FINISHING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Stamping of new full-depth concrete.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete mix design; bonding and chemical admixtures; mixing; placement; finishing of concrete surface to tolerance: floating, troweling, and similar operations; frequency and treatment of control joints.
- B. Section 03 3511 - Concrete Floor Finishes: Concrete coatings.
- C. Section 32 1313 - Concrete Paving: Concrete mix design; concrete placement; ambient conditions; finishing of concrete surface to tolerance: floating, troweling, and similar operations; frequency and treatment of control joints; expansion joint treatment.

**1.03 REFERENCE STANDARDS**

- A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- B. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section.
  - 1. Require attendance of parties directly affecting work of this section, including:
    - a. Installer.
    - b. Contractor's representative.
    - c. Architect.
  - 2. Review mock-ups, material sequence, preparation and application, cleaning, protection and coordination with other work.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Indicate location of construction and control joints.
- D. Design Samples: Submit samples for approval; demonstrate pattern, color, and finishing, using specified materials and techniques, applied to plywood.
  - 1. Number of Samples: One of each color and pattern combination specified.
  - 2. Size: 24 by 24 inches.

**1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by owner.

**1.07 MOCK-UPS**

- A. Construct mock-up(s) of stamped concrete to serve as basis for evaluation of workmanship.
  - 1. Number of Mock-Ups to be Prepared: One.
  - 2. Use same materials and methods for use in the work.
  - 3. Use approved design samples as basis for mock-ups.
  - 4. Record technique, timed procedures and material used.
  - 5. Locate where directed.

6. Minimum Size: 4 by 4 feet.
- B. Obtain approval of mock-up by Architect before proceeding with work.
- C. Retain mock-up(s) until completion of work for use as quality standard.

#### **1.08 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 and handle materials in accordance with manufacturer's instructions.
- C. Keep materials in manufacturer's original, unopened containers and packaging until application.
- D. Store materials in clean, dry area indoors and out of direct sunlight.
- E. Keep materials from freezing.
- F. Protect materials during storage, handling, and application to prevent contamination or damage.

#### **1.09 FIELD CONDITIONS**

- A. Do not install materials when air and surface temperatures are below 55 degrees F or above 80 degrees F.
- B. Do not install materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Stamping Materials:
  1. BRICKFORM: [www.brickform.com/#sle](http://www.brickform.com/#sle).
  2. Concrete Solutions by Rhino Linings: [www.concretesolutions.com/#sle](http://www.concretesolutions.com/#sle).
  3. The Bomanite Company: [www.bomanite.com/#sle](http://www.bomanite.com/#sle).
  4. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 STAMPED CONCRETE APPLICATIONS**

- A. Full Depth Stamped Concrete Slab - Type 1: Patterned new concrete.
  1. Application(s): All indicated exterior locations.
  2. Pattern: To be selected from manufacturer's full line.
  3. Coloring: None, natural cement gray.
  4. As last step, apply combination curing compound / clear sealer.

#### **2.03 FULL-DEPTH CONCRETE SLAB MATERIALS**

- A. See other section(s) for concrete design mix, mixing, forming, and reinforcement.
- B. Slump: 4.0 inches maximum.
- C. Do not use calcium chloride or admixtures containing calcium chloride.
- D. Aggregates: Use non-reactive fine and coarse aggregates free from deleterious material and complying with ASTM C33/C33M.

#### **2.04 STAMPING MATERIALS**

- A. Stamping Mats: Mat type imprinting tools for texturing freshly placed concrete, in pattern and texture to achieve required surface profile and design.
  1. Mat Composition: Polyurethane.
  2. Pattern: To be selected by Architect from manufacturer's full line.
  3. Products:
    - a. BRICKFORM: [www.brickform.com/#sle](http://www.brickform.com/#sle).
    - b. The Bomanite Company: [www.bomanite.com/#sle](http://www.bomanite.com/#sle).
    - c. L.M. Scofield Company; Lithotex Pavecrafters: [www.scofield.com/#sle](http://www.scofield.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

- B. Release Agent: Bond breaker compound capable of releasing stamping forms from concrete without creating surface defects or leaving any residue; type as recommended by stamping mat manufacturer; compatible with concrete, form materials and specified coloring agents.
  - 1. Liquid Release Agent: Self-dissipating, colorless liquid type; intended to be used on both stamping mats and on concrete surface.

### **2.05 SURFACE TREATMENTS**

- A. Clear Sealer: Suitable for interior and exterior application.
  - 1. Composition: Acrylic, water-based.
  - 2. Sheen: Low sheen, matte.
  - 3. Solids Content: Minimum of 25 percent.
  - 4. Color: Clear.
  - 5. Slip Resistant Additive.

### **2.06 ACCESSORY MATERIALS**

- A. Curing and Sealing Compound: Clear, non-yellowing, non-staining, breathable, UV stable curing agent and sealer, complying with ASTM C1315 and compatible with all components of stamped concrete systems.
- B. Concrete Cleaner: Biodegradable cleaning and neutralizing agent for removal of curing compounds.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine surfaces and areas to receive stamped concrete.
- B. Verify that utility penetrations and peripheral work are complete.
- C. Notify Architect of conditions that would adversely affect application or subsequent use.
- D. Do not begin preparation or application until unacceptable conditions are corrected.

### **3.02 PREPARATION**

- A. Protect adjacent surfaces, areas, adjoining walls, and landscaping from overspray, blown dry materials, and damage due to work of this section.

### **3.03 FULL-DEPTH CONCRETE SLABS INSTALLATION**

- A. See other section(s) for concrete forming and placement.

### **3.04 STAMPING**

- A. Match approved mock-ups for pattern, color, texture, and workmanship.
- B. Use stamping mats to create patterns in concrete as indicated on drawings; comply with manufacturer's recommendations and instructions.
- C. Use release agent to prevent damage to concrete surface or creation of bugholes during mat removal.
- D. After removal of stamping mats, make minor surface repairs as required.

### **3.05 CURING**

- A. Protect recently placed materials from premature drying, excessive hot or cold temperatures and mechanical injury until fully cured.

### **3.06 SURFACE TREATMENTS**

- A. Match approved mock-ups for pattern, color, texture, and workmanship.
- B. Wait at least 28 days before applying any surface treatment materials or mechanical finishing.
- C. Clean curing agent residue off surface prior to application of surface treatment materials.
  - 1. Apply concrete cleaner in accordance with manufacturer's instructions to remove excess form release agent, efflorescence, cement scale and curing agents.

- D. Sealer/Coating Application: Apply uniformly over entire surface in accordance with manufacturer's instructions.

### **3.07 PROTECTION**

- A. Do not allow traffic on finished surfaces for the following periods after application:
  - 1. Foot Traffic: Minimum 24 hours.
  - 2. Heavy Traffic: Minimum 72 hours.
- B. Protect finished work from damage during construction and ensure that, except for normal weathering, work will be without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

**SECTION 03 3650  
POLISHED CONCRETE FLOOR SYSTEM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Polished concrete floor system.

**1.02 RELATED SECTIONS**

- A. Section 03 3000 – Cast-in-Place Concrete.
- B. Section 03 3511 – Concrete Floor Finishing.
- C. Section 03 3533 - Stamped Concrete Finishing.

**1.03 DEFINITIONS**

- A. IPCI – International Polished Concrete Institute is a resource for Architects, designers and contractors to learn more about polished concrete. Contractors become certified through educating and testing on various labor driven techniques to perform a proper scope of work. They do not become certified to use certain products.
- B. Concrete Polishing – The process of utilizing industrial diamonds to grind and polish a concrete surface with the application of an impregnating hardeners and sealers that will densify, polish and seal the floor.
  - 1. Process may be either a proprietary system from specialty contractor or use of specified products with acceptable grinding methods.
  - 2. Acceptable Grinding Methods: Equipment and techniques that produce documented results of concrete finishes.

**1.04 REFERENCES**

- A. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
- B. ASTM D 523 – Standard Test Method for Specular Gloss.
- C. ASTM E 1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

**1.05 SYSTEM DESCRIPTION**

- A. Installation of polished concrete floor system for new interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier.
- B. Performance Requirements: Improve performance of floor by installation of polished concrete floor system as measured by the following criteria:
  - 1. Static Coefficient of Friction, ASTM C 1028:
  - 2. Specular Gloss/Reflectance, ASTM D 523:
  - 3. Floor Surface Profile, ASTM E 1155:

**1.06 SUBMITTALS**

- A. Comply with Section 01 3000 – Administrative Requirements.
- B. Product Data: Submit installer's product data, including surface preparation and installation instructions.
- C. Installer's Certification: Submit IPCI certification of installer and installer's employees.
- D. Installer's Project References: Submit installer's list of successfully completed polished concrete floor system projects, including project name and location, name of architect, and type and quantity of polished concrete floor system installed.
- E. Maintenance Manual: Submit installer's maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

**1.07 QUALITY ASSURANCE**

- A. Basis of Design: Perfect Polish, Mechanical Polishing, Ameripolish Dyes.
- B. Installer's Qualifications:
  - 1. Certified IPCI installer.
  - 2. Employ IPCI Certified Craftsmen for installation of polished concrete floor system.
  - 3. Employ IPCI installer with 2-4 years of experience when a floor system involves decorative work.
  - 4. Preinstallation Conference: Conduct conference at Project site before first concrete pour and start of application of Polished Concrete Floor Finish System. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and Manufacturers representative. Review the following:
    - a. Environmental requirements
    - b. Curing methods
    - c. Surface preparation.
    - d. Application and decorative saw cuts.
    - e. Repair.
    - f. Field quality control.
    - g. Cleaning.
    - h. Protection of systems.
- C. Coordination with other work.
  - 1. Coordination: Concrete polisher shall coordinate the following:
    - a. Concrete placement, floating, troweling and curing shall be coordinated with the polisher so surface is acceptable for polishing.
  - 2. Scheduling of joint sealant installation is not detrimental to the polishing process.
    - a. Cleaning of concrete surface prior to performing polishing.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Provide polished concrete samples: size [4] inch x 4 inc or larger if specified for each polished concrete finish required.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage:
  - 1. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
  - 2. Keep materials from freezing.
- C. Handling: Protect materials during handling and application to prevent contamination or damage.

**PART 2 PRODUCTS****2.01 INSTALLER**

- A. Consult IPCI to find certified IPCI installers.
  - 1. International Polished Concrete Institute, Toll Free (866) 421-9550. Website [www.ipcionline.org](http://www.ipcionline.org). E-mail [info@ipcionline.org](mailto:info@ipcionline.org).
    - a. Perfect Polish, (865)-494-5820. Website [www.perfectpolishonline.com](http://www.perfectpolishonline.com)

**2.02 GRINDING AND POLISHING EQUIPMENT**

- A. Floor Grinder: Polishing shall be a dry diamond method, not wet, utilizing metal bonded diamond/resin bonded diamond multi orbital planetary action opposing rotational diamond headed machine with approximate grinding pressure of 675 pounds or more.
- B. Vacuum System: Vacuum system shall be directly connected to floor grinder to reduce amount of dust exposure. HEPA filtration system is required.

## 2.03 MATERIALS

- A. Concrete Densifier: Clear, odorless liquid form of a lithium silicate to permanently seal, densify, dustproof and harden concrete surfaces and provide abrasion resistance by penetrating into concrete pores and chemically reacting. Products must conform and meet minimum performance characteristics as described herein.
- B. Concrete Sealer: Clear, highly concentrated, quick drying penetrating water & oil repellent sealer specifically designed to deeply impregnate the surface pores and chemically bond with the concrete floor to increase durability.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine floor to receive polished concrete floor system.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin surface preparation or installation until unacceptable conditions are corrected.
- D. Verify the Following for New Concrete Floors:
  - 1. Floor Finish:
    - a. Slabs and flatwork shall be placed and finished monolithically.
    - b. Strike off to true, plane surfaces at required elevations.
    - c. Thoroughly compact concrete with vibrators, floats, and tampers to force coarse aggregate below the surface.
    - d. Laser Screed floor when applicable
    - e. Low speed power trowel with no hand finishing.
    - f. Pan float.
    - g. Steel trowel finish.
    - h. Surface should not be burned due to excessive troweling.
    - i. Imprints are not acceptable (i.e. boots, foreign objects dropped into concrete).
  - 2. Floor and Joints:
    - a. Free of debris and excessive dirt, dust, clay, and mud.
    - b. Dry.
  - 3. Floor Surface Profile:
    - a. Floor Flatness Number (FF): 50 (preferred)\_45 (minimum).
    - b. Floor Levelness Number (FL): 35 (preferred) 30 (minimum).
  - 4. Concrete Compressive Strength: 3,500 psi to 5,000 psi.
  - 5. Lightweight Concrete: Not allowed if aggregate exposure is required.
  - 6. Concrete Curing: Minimum 8 days water cured or dissipating curing compound applied.
    - a. Concrete Adjacent to Floor Penetrations: Troweled flat and level with surrounding concrete.
  - 7. Concrete Adjacent to Drains, clean-outs, etc: Finish level to the top of the structure.

### 3.02 SURFACE PREPARATION

- A. Protection: Protect surrounding areas and adjacent surfaces from the following:
  - 1. Minimal accumulation of dust from grinding and polishing.
  - 2. Contact with overspray of concrete densifier.
  - 3. Contact with overspray of concrete sealer.
- B. Surface Preparation: Prepare surfaces in accordance with installer's instructions.
- C. Clean Surfaces: Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, and other surface contaminants which could adversely affect installation of polished concrete floor system.

### 3.03 INSTALLATION

- A. Install polished concrete floor system in accordance with installer's instructions at locations indicated on the Drawings.



- B. Aggregate Exposure:
  - 1. Small Aggregate: Mottled salt-and-pepper coarse aggregate exposure.
- C. Polished Concrete Floor System: IPCI Sheen Level 3 – Median Gloss.
  - 1. Preparation Step:
    - a. Remove existing floor coatings by grinding with 16-grit metal-bonded diamonds.
    - b. Remove existing floor coatings and level floor by grinding with 40-grit metal-bonded diamonds.
    - c. Open-up concrete to accept concrete densifier by grinding with 80-grit metal-bonded diamonds.
  - 2. Apply concrete densifier to deeply saturate floor.
  - 3. Remove residue of concrete densifier dried on floor surface by grinding with 150-grit metal-bonded diamonds.
  - 4. Floor Closure Polishing:
    - a. Remove 150-grit metal-bonded diamond scratches by grinding with 100-grit resin-bonded diamonds.
    - b. Remove 150-grit metal-bonded and 100-grit resin-bonded diamond scratches by grinding with 200-grit resin-bonded diamonds.
    - c. Prepare floor for polishing by grinding with 400-grit resin-bonded diamonds.
    - d. Achieve light-reflective finish when viewed from a distance of 30 feet by grinding with 800-grit resin-bonded diamonds.
  - 5. Apply concrete sealer.
- D. Hand Tooling: When applicable in project utilize similar grinding and polishing process to blend the edges of all perimeter areas where obstructions lye with a variable speed polisher.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspect completed polished concrete floor system with Owner, Contractor, Architect, and Installer.
- B. Review procedures with Architect to correct unacceptable areas of completed polished concrete floor system.
- C. Testing: Test the following from completed polished concrete floor system:
  - 1. Static Coefficient of Friction, ASTM C 1028:
    - a. Dry surface.
    - b. Wet surface.
  - 2. Specular Gloss/Reflectance, ASTM D 523:
  - 3. Floor Surface Profiles, ASTM E 1155:
  - 4. Compare test results from tests performed before and after installation of polished concrete floor system.

#### **3.05 PROTECTION**

- A. Protect completed polished concrete floor system from damage until Substantial Completion.
  - 1. All hydraulic powered equipment shall be diapered to avoid staining of concrete.
  - 2. Vehicle parking on polished concrete slab shall be prohibited. If necessary to complete their scope of work, drop clothes shall be placed under vehicles.
  - 3. No pipe cutting machine shall be used on the finished floor slab.
  - 4. Steel shall not be placed on the finish slab to avoid rusting.
  - 5. Acids and acid detergents shall not be used nor come in contact with the slab.
  - 6. All painters to use drop clothes on finished slab. If spilled, paint must be immediately removed.
  - 7. All trades will be informed that the slab must be protected at all times.
  - 8. Repair damaged areas of completed polished concrete floor system to satisfaction of the Architect.

**END OF SECTION**

**SECTION 04 2000  
UNIT MASONRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
- C. Section 07 2500 - Weather Barriers: Water-resistive barriers applied to exterior face of backing sheathing or unit masonry substrate.
- D. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- E. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
- F. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2022b.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- H. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- I. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- J. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

- O. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- Q. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- R. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- S. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- T. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
- U. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- V. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- W. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.
- X. UL (FRD) - Fire Resistance Directory; Current Edition.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
  - 1. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.

#### **1.06 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 .
- C. Designer Qualifications: Perform 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.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

#### **1.07 MOCK-UPS**

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

#### **1.08 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 and nominal depths as indicated on drawings for specific locations.
  - 2. Special Shapes: Provide nonstandard blocks configured for corners.
  - 3. Load-Bearing Units: ASTM C90, normal weight.
    - a. Hollow block, as indicated.
    - b. Exposed Faces: Manufacturer's standard color and texture where indicated.
  - 4. Nonloadbearing Units: ASTM C129.
    - a. Hollow block, as indicated.
    - b. Normal weight.

### **2.02 BRICK UNITS**

- A. Basis of Design Manufacturers:
  - 1. Taylor Clay Products, Inc.; [www.taylorclay.com](http://www.taylorclay.com).
- B. Other Acceptable Manufacturers:
  - 1. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- C. Substitutions: See section 01 6000 - Product Requirements.
- D. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
  - 1. Color and texture: Modular wirecut #322 Grey.
  - 2. Modular size: 3 5/8 inch x 2 1/4 inch x 7 5/8 inch.
  - 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
  - 4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

### **2.03 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
  - 1. Not more than 0.60 percent alkali.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. 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.
- F. Water: Clean and potable.

### **2.04 REINFORCEMENT AND ANCHORAGE**

- A. Manufacturers:
  - 1. Blok-Lok Limited: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
  - 2. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
  - 3. WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), 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: Truss or ladder.
  - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
  - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Truss.
  - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
  - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- F. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
  - 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
  - 3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
  - 4. Vertical adjustment: Not more than 1 1/4 inches.
  - 5. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
  - 6. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
- 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 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 thick.
  - 3. Vertical adjustment: Not less than 3-1/2 inches.

## 2.05 FLASHINGS

- A. Metal Flashing Materials:
  - 1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
- B. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
  - 1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner.
    - a. Manufacturers:
      - 1) STS Coatings, Inc: [www.stscoatings.com/#sle](http://www.stscoatings.com/#sle).
      - 2) VaproShield, LLC: [www.vaproshield.com/#sle](http://www.vaproshield.com/#sle).
      - 3) WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
      - 4) Substitutions: See Section 01 6000 - Product Requirements.
- C. Membrane Non-Asphaltic Flashing Materials:
  - 1. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch thick.
    - a. Manufacturers:
      - 1) Heckmann Building Products, Inc: [www.heckmannbuildingprods.com/#sle](http://www.heckmannbuildingprods.com/#sle)
      - 2) Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).

- 3) WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
  - 4) Substitutions: See Section 01 6000 - Product Requirements.
- D. Termination Bars: Stainless steel; compatible with membrane and adhesives.
1. Manufacturers:
    - a. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - b. Mortar Net Solutions: [www.mortarnet.com/#sle](http://www.mortarnet.com/#sle).
    - c. York Manufacturing, Inc: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- E. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
1. Manufacturers:
    - a. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - b. Mortar Net Solutions: [www.mortarnet.com/#sle](http://www.mortarnet.com/#sle).
    - c. York Manufacturing, Inc: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

## 2.06 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
1. Manufacturers:
    - a. Blok-Lok Limited: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
    - b. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - c. WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
1. Manufacturers:
    - a. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - b. WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- 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.
1. Full-Height Airspace Maintenance and Drainage Material: Mesh panels fitted between masonry ties.
    - a. Drainage Material Thickness: 3/8 inch.
    - b. Manufacturers:
      - 1) Advanced Building Products, Inc: [www.advancedbuildingproducts.com/#sle](http://www.advancedbuildingproducts.com/#sle).
      - 2) CavClear, a Division of Archovations Inc: [www.cavclear.com/#sle](http://www.cavclear.com/#sle).
- D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.
- E. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 1000.
- F. Weeps:
1. Type: Extruded propylene with honeycomb design.
  2. Color(s): As selected by Architect from manufacturer's full range.
  3. Manufacturers:
    - a. Blok-Lok Limited: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
    - b. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - c. WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

**2.07 LINTELS**

- A. Concrete Masonry Unit Lintels as detailed.
- B. Brickwork Support System: Offset steel relief angles or lintels with hanger brackets for support of brickwork above horizontal masonry joints and openings to allow insulation to span continuously behind brick and eliminate continuous thermal bridges associated with support systems that interrupt continuous insulation.
  - 1. Anchorage: Wedge type expansion bolts in concrete or grout-filled CMU backup.
  - 2. Materials: Steel, hot dip galvanized to ASTM A153/A153M class B.

**2.08 MORTAR AND GROUT MIXING**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  - 1. Masonry below grade and in contact with earth: Type S.
  - 2. Exterior, non-loadbearing masonry: Type N.
  - 3. Interior, loadbearing masonry: Type N.
  - 4. Interior, non-loadbearing masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

**3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

**3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

**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.
  - 3. Mortar Joints: Concave.
- D. Brick Units:

**3.05 WEEPS/CAVITY VENTS**

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

**3.06 CAVITY MORTAR CONTROL**

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
  - 1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
  - 2. Hold cavity mortar control panel tight to face wythe.
  - 3. Install horizontally between joint reinforcement.
  - 4. Stagger end joints in adjacent rows.
- 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.

### **3.07 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 on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches 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 mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- G. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

### **3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER**

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

### **3.09 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY**

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as indicated on drawings.

### **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, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, 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 minimum on vertical surface of backing:
  - 1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
  - 2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
  - 3. Anchor vertical leg of flashing into backing with a termination bar and sealant.
  - 4. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.



- E. Extend EPDM flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

### **3.11 LINTELS**

- A. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
  - 1. See Schedule on Drawings.
  - 2. Do not splice reinforcing bars.
  - 3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
  - 4. Place and consolidate grout fill without displacing reinforcing.
  - 5. Allow masonry lintels to attain specified strength before removing temporary supports.
- B. See Details for minimum bearing.
- C. Install thermal brick support system in accordance with manufacturer's instructions at locations indicated on drawings

### **3.12 GROUTED COMPONENTS**

- A. Reinforce masonry as detailed or scheduled.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. Provide minimum bearing detailed or scheduled.

### **3.13 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joint as detailed on drawings.

### **3.14 BUILT-IN WORK**

- A. As work progresses, install built-in metal door frames and window 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 frames in adjacent mortar joints. Fill frame voids solid with grout.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

### **3.15 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

### **3.16 CUTTING AND FITTING**

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

**3.17 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

**3.18 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.

**3.19 PROTECTION**

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION**

**SECTION 04 4313  
STONE MASONRY VENEER**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Anchored cut stone veneer at exterior walls.
- B. Adhered cut stone veneer at exterior walls.
- C. Metal anchors and accessories for anchored veneer.
- D. Accessories for adhered veneer.
- E. Setting mortar and pointing mortar.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Joint reinforcement, Ties, Anchors, and Through-wall flashing.
- B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Flashings.
- D. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

**1.03 REFERENCE STANDARDS**

- A. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- D. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2022a.
- E. ASTM C1515 - Standard Guide for Cleaning of Exterior Dimension Stone, Vertical And Horizontal Surfaces, New or Existing; 2020.
- F. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone; 2020.
- G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on stone units, mortar, and reinforcement.
- C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, color range, texture, and markings.
- D. Stone Fabricator's Qualification Statement.
- E. Installer's Qualification Statement.
- F. NSI Installer Qualification: Documentation of Natural Stone Institute Accreditation.

**1.05 QUALITY ASSURANCE**

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 3 years of documented experience.

**1.06 MOCK-UP**

- A. Construct stone wall mock-up, 6 feet long by 8 feet wide; include stone anchor accessories, corner condition, and typical control joint in mock-up.
- B. See Section 01 4000 - Quality Requirements for additional requirements.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

#### **1.08 FIELD CONDITIONS**

- A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

### **PART 2 PRODUCTS**

#### **2.01 STONE**

- A. Stone, General: See recommendations in ASTM C1528/C1528M.
- B. Appalachian Field Stone:
  - 1. Real Rock - Cottage Split Stack from Lamb Stone; [www.lambstone.com](http://www.lambstone.com).
    - a. Anchored and adhered stone, difference is thickness and method of laying.

#### **2.02 MORTAR APPLICATIONS**

- A. Field-mix all mortar.
- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Setting Bed Mortars: Setting bed used to adhere stone veneer units to concrete masonry.
  - 1. Site-Mixed: ASTM C270, Type S, using the Proportion Method as specified in Section 04 0511.
  - 2. Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.
- D. Setting Bed Mortars: Setting bed used to adhere stone veneer units to cement board.
  - 1. Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.
- E. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual stone veneer units once the setting bed mortar has sufficiently cured.
  - 1. Site-Mixed: ASTM C270, Type N, using the Proportion Method.
  - 2. Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.

#### **2.03 ACCESSORIES - ANCHORED VENEER**

- A. Horizontal Joint Reinforcement: Truss type; stainless steel wire complying with ASTM A580/A580M Type 304, 3/16 inch diameter side rods with 0.1483 inch diameter cross ties.
  - 1. Manufacturers:
    - a. Blok-Lok Limited: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
    - b. Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Ties: Formed steel wire, at least 0.1483 inch diameter, stainless steel complying with ASTM A580/A580M, eye and pintle type, with provision for vertical adjustment after attachment.
- C. Other Anchors in Direct Contact with Stone: ASTM A666 Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.
- D. Setting Buttons and Shims: Lead.
- E. Flashings: See Section 04 2000.
- F. Weep/Cavity Vents: Molded PVC grille, insect resistant.
  - 1. Products:

a. Masonry Technology, Inc; Stone Cavity Weep: [www.mtidry.com/#sle](http://www.mtidry.com/#sle).

G. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

#### **2.04 ACCESSORIES - ADHERED VENEER**

A. Water-Resistive Barrier: See Section 07 2500.

B. Flashings: See Section 04 2000.

#### **2.05 STONE FABRICATION - ANCHORED VENEER**

A. Nominal Thickness: 4 inch.

B. Nominal Face Size: Random.

C. Pattern and Coursing: stacked field stone.

D. Fabricate for 3/8 inch beds and joints.

E. Bed and Joint Surfaces:

1. Cut or sawn full square for full thickness of unit.

2. Sawn or cut full square at least two-thirds of unit thickness; from that point back under square not more than 1 inch in 12 inches.

F. Backs: Sawn.

G. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

H. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.

#### **2.06 STONE FABRICATION - ADHERED VENEER**

A. Follow manufacturer's recommendations for installation.

B. Comply with ASTM C1242 requirements for adhered stone system without mechanical anchors for maximum stone weight and maximum individual stone panel size.

C. Nominal Thickness: 2 inch.

D. Height: As indicated on drawings.

E. Length: As indicated on drawings.

F. Style: As indicated on drawings.

G. Fabricate for 3/8 inch beds and joints.

H. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

A. Verify that support work and site conditions are ready to receive work of this section.

1. Per ASTM C1242, exterior walls to receive thin natural stone veneers should be designed with a stiffness ratio of L/1000 minimum.

B. Verify that items built-in under other sections are properly located and sized.

#### **3.02 PREPARATION - ANCHORED VENEER**

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean stone prior to installation. Do not use wire brushes or implements that mark or damage exposed surfaces.

C. Clean sawn surfaces of rust stains and iron particles.

#### **3.03 PREPARATION - ADHERED VENEER**

A. Dampen masonry surfaces to reduce excessive suction.

- B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.
- C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.
- D. Apply dash bond coat to solid bases and moist cure for at least 24 hours before applying setting bed.

### **3.04 INSTALLATION - ANCHORED VENEER**

- A. Size stone units to fit opening dimensions and perimeter conditions.
- B. Arrange stone coursing in ashlar bond with consistent joint width.
- C. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.
- D. Install weep/cavity vents in vertical stone joints at 32 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

### **3.05 REINFORCEMENT AND ANCHORAGE - ANCHORED VENEER**

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place horizontal joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Embed wall ties in masonry back-up to bond veneer to back-up at maximum 16 inches on center vertically and 36 inches on center horizontally.
- F. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

### **3.06 JOINTS - ANCHORED VENEER**

- A. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.
- B. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.

### **3.07 INSTALLATION - ADHERED VENEER**

- A. Install thin stone veneer with a cementitious mortar setting bed to a cement board backing surface, in accordance with stone fabricator's instructions and applicable sections of the ICC (IBC), TMS 402/602 and ASTM C1242 that apply to adhered masonry veneer.
- B. Mortar Joints: Concave.
- C. Pattern Bond:
  - 1. Lay out work in advance and distribute color range of stone uniformly over total work area.
  - 2. Lay stone with face exposed.
  - 3. Take care to avoid concentration of any one color to any one wall surface.
  - 4. Maintain approximate 3/8 inch joint, as stone allows.
  - 5. Do not use stacked vertical joints.
- D. Windows, Doors and Wall Openings: Extend field stone units to edges of wall openings.
- E. Sills: Install sills where located on drawings.
- F. Caps: Install cast stone capstones where located on drawings.
- G. Seal all joints at wall openings and penetrations with sealant approved for use with adhered stone veneer.

### **3.08 INSTALLATION - 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.
- B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

### **3.09 CONTROL AND EXPANSION JOINTS**

- A. Form joints as detailed on drawings.

### **3.10 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

### **3.11 CLEANING**

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Clean exterior stone per ASTM C1515.
- D. Use non-metallic tools in cleaning operations.

### **3.12 PROTECTION**

- A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

**END OF SECTION**

**SECTION 04 7200  
CAST STONE MASONRY**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Architectural cast stone.
- B. Units required are:
  - 1. Exterior wall units, including coping, lintels, sills, water tables, and sign pieces.
  - 2. Other items indicated on drawings.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- B. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

**1.03 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).
- J. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
  - 2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.



- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

#### **1.06 MOCK-UPS**

- A. Provide full size cast stone components for installation in mock-up of exterior wall.
- B. See Section 01 4000 - Quality Requirements for additional requirements.
- C. Approved mock-up will become standard for appearance and workmanship.
- D. Mock-up may remain as part of the completed work.
- E. Remove mock-up not incorporated into the work and dispose of debris.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Architectural Cast Stone:
  - 1. Reading Rock, Inc.; [www.readingrock.com](http://www.readingrock.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 ARCHITECTURAL CAST STONE**

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural granite, complying with ASTM C1364.
  - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
  - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
  - 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
  - 4. Color: Selected by Architect from manufacturer's full range.
  - 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
  - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
  - 2. Unless otherwise indicated on drawings, provide:
    - a. Wash or slope of 1:12 on exterior horizontal surfaces.
    - b. Drips on projecting components, wherever possible.
    - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.

1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

### **2.03 MATERIALS**

- A. Portland Cement: ASTM C150/C150M.
  1. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Admixtures: ASTM C494/C494M.
- E. Water: Potable.
- F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
  1. Galvanized in accordance with ASTM A767/A767M, Class I.
- G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- I. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

### **2.04 SOURCE QUALITY CONTROL**

- A. Test compressive strength and absorption of specimens selected at random from plant production.
  1. Test in accordance with ASTM C642.
  2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
  1. Drench cast stone components with clear, running water immediately before installation.
  2. Set units in a full bed of mortar unless otherwise indicated.
  3. Fill vertical joints with mortar.
  4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

### **3.03 TOLERANCES**

- A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
  1. Rake mortar joints 3/4 inch for pointing.
  2. Remove excess mortar from face of stone before pointing joints.
  3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
  4. Leave the following joints open for sealant:

- a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
  - b. Joints in projecting units.
  - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
  - d. Joints below lugged sills and stair treads.
  - e. Joints below ledge and relieving angles.
  - f. Joints labeled "expansion joint".
- B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
  2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
  3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
  4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

### **3.04 REPAIR**

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 10 feet.
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Architect 's approval.

### **3.05 CLEANING**

- A. Keep cast stone components clean as work progresses.

### **3.06 PROTECTION**

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

**END OF SECTION**

**SECTION 05 1200 - STRUCTURAL STEEL 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. Section Includes:
  - 1. Structural steel.
- B. Related Sections:
  - 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
  - 2. Section 053100 "Steel Decking" for field installation of shear 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 metal items not defined as structural steel.
  - 4. Section 055100 "Metal Stairs."
  - 5. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for surface-preparation and priming requirements.

**1.03 DEFINITIONS**

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

**1.04 PERFORMANCE REQUIREMENTS**

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
  - 1. Select and complete connections using schematic details indicated and AISC 360 .
- B. Moment Connections: Type FR, fully restrained.

**1.05 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment drawings.
  - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  - 5. Identify members and connections of the seismic-load-resisting system.
  - 6. Indicate locations and dimensions of protected zones.
  - 7. Identify demand critical welds.
  - 8. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
  - 1. Power source (constant current or constant voltage).
  - 2. Electrode manufacturer and trade name, for demand critical welds.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer, fabricator, professional engineer.
- 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, 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 if applicable.
  - 3. Tension-control, high-strength bolt-nut-washer assemblies.
  - 4. Shear stud connectors.
  - 5. Shop primers.
  - 6. Nonshrink grout.
- F. Source quality-control reports.

#### 1.07 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. AWS states that welding qualifications remain in effect indefinitely unless welding personnel have not welded for more than six months or there is a specific reason to question their ability.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- F. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303.
  - 2. AISC 341 and AISC 341s1.
  - 3. AISC 360.
  - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- G. Preinstallation Conference: Conduct conference at Project site.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

#### 1.09 COORDINATION

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

### PART 2 PRODUCTS

#### 2.01 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B C, structural tubing.
- D. Channels, Angles: ASTM A 36/A 36M.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- F. Cold Formed Hollow Structure Sections: ASTM A 500, Grade B structural tubing.
- G. Welding Electrodes: Comply with AWS requirements.

#### 2.02 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
  - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
  - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
  - 4. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- D. Threaded Rods: A 572/A 572M, Grade 50 (345).
  - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
  - 2. Washers: ASTM A 36/A 36M carbon steel.
  - 3. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

#### 2.03 PRIMER

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."
- C. Galvanizing Repair Paint: ASTM A 780.

#### 2.04 GROUT

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

#### 2.05 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 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, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning"
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not 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.

#### 2.06 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.07 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 (50 mm).
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."

## 2.08 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
  - 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

## 2.09 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
  - 1. Liquid Penetrant Inspection: ASTM E 165.
  - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - 3. Ultrasonic Inspection: ASTM E 164.
  - 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.



- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing 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 grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

### 3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened unless indicated.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

### 3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
  1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

### 3.06 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: 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.
  1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting."

END OF SECTION 05 1200

**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. Section Includes:**

- 1. Roof deck.
- 2. Composite floor deck.

**B. Related Requirements:**

- 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
- 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
- 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
- 4. Section 099113 "Exterior Painting" for repair painting of primed deck and finish painting of deck.

**1.03 ACTION SUBMITTALS**

- A. Product Data: For each type of deck, accessory, and product indicated.

**B. Shop Drawings:**

- 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

**1.04 INFORMATIONAL SUBMITTALS****A. Welding certificates.****B. Product Certificates:** For each type of steel deck.**C. Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

- 1. Power-actuated mechanical fasteners.

**D. Evaluation Reports:** For steel deck.**E. Field quality-control reports.****1.05 QUALITY ASSURANCE****A. Testing Agency Qualifications:** Qualified according to ASTM E 329 for testing indicated.**B. Welding Qualifications:** Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."**C. FM Global Listing:** Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.**1.06 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 water-proof covering and ventilate to avoid condensation.**

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

## **PART 2 PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

### **2.02 ROOF DECK**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. ASC Profiles, Inc.; a Blue Scope Steel company.
  2. Canam United States; Canam Group Inc.
  3. CMC Joist & Deck.
  4. Consolidated Systems, Inc.; Metal Dek Group.
  5. Cordeck.
  6. DACS, Inc.
  7. Epic Metals Corporation.
  8. Marlyn Steel Decks, Inc.
  9. New Millennium Building Systems, LLC.
  10. Nucor Corp.; Vulcraft Group.
  11. Roof Deck, Inc.
  12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
  13. Verco Manufacturing Co.
  14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
  1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS).
  2. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 33 (230) minimum, AZ50 (AZ150) aluminum-zinc-alloy coating.
  3. Deck Profile: As indicated.
  4. Profile Depth: As indicated.
  5. Design Uncoated-Steel Thickness: As indicated.
  6. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
  7. Span Condition: As indicated.
  8. Side Laps: Overlapped or interlocking seam at Contractor's option.

### **2.03 COMPOSITE FLOOR DECK**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. ASC Profiles, Inc.; a Blue Scope Steel company.

2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Verco Manufacturing Co.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), G60 (Z180).
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

#### 2.04 NONCOMPOSITE FORM DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Marlyn Steel Decks, Inc.
8. New Millennium Building Systems, LLC.
9. Nucor Corp.; Vulcraft Group.
10. Roof Deck, Inc.
11. Valley Joist; Subsidiary of EBSCO Industries, Inc.
12. Verco Manufacturing Co.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

- B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), G60 (Z180) zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

#### 2.05 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (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.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level sloped recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A 780.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

### **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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION, GENERAL**

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

#### **3.03 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 that is not less than 1-1/2 inches (38 mm) long, and as follows:

1. Weld Diameter: 3/4 inch (19 mm), nominal.
  2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28 as indicated.
  3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (457 mm), and as follows:
1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
  2. Mechanically clinch or button punch.
  3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

#### 3.04 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
1. Weld Diameter: 3/4 inch (19 mm), nominal.
  2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
  3. Weld Spacing: Space and locate welds as indicated.
  4. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:
1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
  2. Mechanically clinch or button punch.
  3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
1. End Joints: Lapped or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Revise "Floor-Deck Closures" Paragraph below to suit Project. Sealing cellular deck openings, butt joints, and junctions with trench headers with tape is not included in this Section. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, ac-

ording to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

- F. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

### 3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.06 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. 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.
  - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: 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."
- D. 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 4000  
COLD-FORMED METAL FRAMING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Formed steel stud exterior wall framing.
- B. Exterior wall sheathing.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 4313 - Stone Masonry Veneer
- B. Section 05 3100 - Steel Decking.
- C. Section 05 4400 - Cold-Formed Metal Trusses.
- D. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.
- E. Section 07 2100 - Thermal Insulation: Insulation within framing members.
- F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- G. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.
- H. Section 07 9200 - Joint Sealants.
- I. Section 09 2116 - Gypsum Board Assemblies: Cold-formed steel nonstructural framing.

**1.03 DEFINITIONS**

- A. General: See AISI S240 for definitions of terms used in this section.

**1.04 REFERENCE STANDARDS**

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- H. ASTM C1185 - Standard Test Methods for Sampling and Testing Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards; 2023.
- I. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).
- J. ASTM D1293 - Standard Test Methods for pH of Water; 2018.
- K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- M. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

- N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
- O. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- P. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

#### **1.06 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.
- C. Product Data: Provide manufacturer's data on factory-made connectors and mechanical fasteners, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
- E. Design Data:
  - 1. Shop drawings signed and sealed by a professional structural engineer registered in the State of Alabama.
- F. Inspection Reports: Provide material verification Inspection Reports in accordance with requirements of AISI S240.
- G. Testing Agency Qualification Statement.
- H. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before the start of scheduled welding work.
- I. Testing Agency Qualification statement.

#### **1.07 QUALITY ASSURANCE**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
- D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.
- E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Comply with requirements for Contractor's design-related professional design services indicated in Section 01 4000 - Quality Requirements.
- B. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

- C. Regulatory Requirements: Comply with applicable building code criteria for loads, including seismic loads.

## **2.02 MATERIALS**

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
  - 1. Structural Grade: As required to meet design criteria.
  - 2. Corrosion Protection Coating Designation: CP 60 in accordance with AISI S240.

## **2.03 STRUCTURAL FRAMING COMPONENTS**

- A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

## **2.04 CONNECTIONS**

- A. Performance Requirements: Provide connections in compliance with requirements of AISI S240.
- B. Structural Performance: Maintain load and movement capacity required by applicable building code and specified design criteria.

## **2.05 MISCELLANEOUS CONNECTIONS**

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.

## **2.06 SHEATHING**

- A. Sheathing
  - 1. Cementitious sheathing panels.
    - a. Thickness: 3/4 inch, nominal, unless otherwise noted.
    - b. Edges: Square.
    - c. Fire Resistance: Noncombustible, when tested in accordance with ASTM E136.
    - d. Surface Burning Characteristics: Flame spread index of 0; smoke developed index of 0; when tested in accordance with ASTM E84.
    - e. Mold Resistance: Rating of 10, when tested in accordance with ASTM D3273.
    - f. Density: 75 psf in accordance with ASTM C1185.
    - g. Weight: 5 psf in accordance with ASTM D1037 at thickness of 3/4 inch.
    - h. pH Value: 10 when tested in accordance with ASTM D1293.

## **2.07 ACCESSORIES**

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that abutting building framing components are ready to receive work.

### **3.02 INSTALLATION - GENERAL**

- A. Install structural members and connections in compliance with ASTM C1007.

### **3.03 INSTALLATION OF STUDS**

- A. Install wall studs plumb and level.
- B. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- C. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.
- D. Touch-up field welds and damaged corrosion-protected surfaces zinc-rich paint in compliance with ASTM A780/A780M.

**3.04 INSTALLATION OF WALL SHEATHING**

- A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

**3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide material verification inspections in accordance with requirements of AISI S240.
- C. Coordination of Other Tests and Inspections: Owner will employ independent testing agency to test and/or inspect welding and mechanical fastening; provide access and assistance as required to accommodate timely performance.

**3.06 TOLERANCES**

- A. Studs - Vertical Alignment (Plumbness): 1/960 of span or 1/8 inch in 10 ft, in accordance with ASTM C1007.
- B. Studs - Maximum Variation from True Position: 1/8 inch in accordance with ASTM C1007.

**END OF SECTION**

**SECTION 054400 - COLD-FORMED METAL TRUSSES****PART 1 - GENERAL****1.1 SUMMARY**

## A. Section Includes:

1. Roof trusses.

**1.2 ACTION SUBMITTALS**

## A. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

## B. Delegated-Design Submittal: For cold-formed steel trusses.

**1.3 INFORMATIONAL SUBMITTALS**

## A. Welding certificates.

## B. Product test reports.

## C. Field quality-control reports.

**1.4 QUALITY ASSURANCE**

## A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

## B. Product Tests: Mill certificates or data from a qualified independent testing agency.

## C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

## A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel trusses.

## B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
  - a. Roof Trusses: Vertical deflection of 1/240 of the span.

## C. Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:

1. Roof Trusses: AISI S214.

**2.2 COLD-FORMED STEEL TRUSS MATERIALS**

## A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G60 (Z180), A60 (ZF180)

**2.3 ROOF TRUSSES**

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
  - 1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
  - 2. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm)

**2.4 TRUSS ACCESSORIES**

- A. Fabricate steel-truss accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

**2.5 ANCHORS, CLIPS, AND FASTENERS**

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Power-Actuated Fasteners: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

**2.6 MISCELLANEOUS MATERIALS**

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

**3.2 INSTALLATION**

- A. Install bridge, and brace cold-formed steel trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.
  - 1. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure.
  - 2. Install continuous bridging and permanently brace trusses as indicated on Drawings, as indicated on Shop Drawings and designed according to CFSEI's Technical Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- B. Install cold-formed steel trusses and accessories true to line and location, and with connections securely fastened.

- C. Install temporary bracing and supports to secure trusses and support loads equal 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 trusses are secured.
- D. Truss Spacing: As indicated on Drawings.

### **3.3 ERECTION TOLERANCES**

- A. Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### **3.4 REPAIR**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

### **3.5 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Cold-formed metal trusses will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

**END OF SECTION 054400**

**SECTION 05 5000  
METAL FABRICATIONS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

**1.03 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM 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 A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- H. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- I. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- M. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).
- O. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- P. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- Q. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- R. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- S. SSPC-SP 2 - Hand Tool Cleaning; 2018.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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.

### **1.05 QUALITY ASSURANCE**

- A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.
- 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. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

### **2.02 MATERIALS - ALUMINUM**

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Stainless steel.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

### **2.03 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. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### **2.04 FABRICATED ITEMS**

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- B. See Drawings for manufactured Cast and Wrought Iron Bollards and Corner Guards by Architectural Iron Company, 104 Ironwood Court, Milford PA 18337. (800) 442 - IRON.
- C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- D. Lintels: As detailed; galvanized finish.
- E. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; galvanized finish.

### **2.05 ALUMINUM TRAFFIC GATE**

- A. Provide aluminum traffic gate as indicated on Drawings. Provide hinges and all automatic gate operation equipment. Coordinate with Electrical and Gate Operator Supplier.

## **2.06 FINISHES - STEEL**

- A. Prime paint steel items.
  - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items as specified.
  - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- 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 Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

## **2.07 FINISHES - ALUMINUM**

- A. Exterior Aluminum Surfaces: Class I natural anodized.
- B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

## **2.08 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **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. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

### **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 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.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 05 5133  
METAL LADDERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop-fabricated metal ladders.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5213 - Pipe and Tube Railings.
- B. Section 09 9000 - Painting and Coating.

**1.03 REFERENCE STANDARDS**

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).
- I. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- L. SSPC-SP 2 - Hand Tool Cleaning; 2018.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. 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.
  - 2. 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.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

**1.05 QUALITY ASSURANCE**

- A. Design work 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. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

- C. 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. Plates: ASTM A283/A283M.
- C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- D. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- E. Bolts, Nuts, and Washers: ASTM A307, 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.

### **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. 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 members spaced at 20 inches.
  - 2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
  - 3. Space rungs 7 inches from wall surface.

### **2.04 FABRICATED LANDING**

- A. Construct as indicated on drawings.
- B. Provide steel plate floor, unless otherwise noted.
- C. Provide railings and safety gate as indicated on drawings.

### **2.05 FINISHES - STEEL**

- A. Prime paint steel items.
  - 1. Do not prime surfaces in direct contact with concrete.
- 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.

### **2.06 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.

- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

### **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 setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

#### **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 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.
- F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 05 5213  
PIPE AND TUBE RAILINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Free-standing railings.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 9000 - Painting and Coating.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- C. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
  - 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 within the previous 12 months.

**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. Comply with ASTM E985.
- C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds 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
- E. Allow for expansion and contraction of members and building movement without damage to connections or members.
- F. Dimensions: See drawings for configurations and heights.
  - 1. Top Rails: 2 inches diameter, round.
  - 2. Posts: 2 inches diameter, round.
  - 3. Posts: 1-1/2 inches square.
- G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
  - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.

- H. 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 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.

## **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 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. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**



**SECTION 06 1000  
ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Rough opening framing for doors, windows, and roof openings.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Communications and electrical room mounting boards.
- E. Concealed wood blocking, nailers, and supports.
- F. Miscellaneous wood nailers, furring, and grounds.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 04 2000 - Unit Masonry.

**1.03 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.
- C. PS 1 - Structural Plywood; 2009 (Revised 2019).
- D. PS 20 - American Softwood Lumber Standard; 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

**1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. 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.
  - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at [www.alsc.org](http://www.alsc.org), and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

**2.02 CONSTRUCTION PANELS**

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in

accordance with ASTM E84.

- B. Other Applications:
  - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
  - 3. Other Locations: PS 1, C-D Plugged or better.

### **2.03 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
  - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
  - 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
  - 2. Preservative Pressure Treatment of Plywood Above Grade: AWPA 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. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

### **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.

### **3.04 INSTALLATION OF CONSTRUCTION PANELS**

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches 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.

### **3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.

### **3.06 CLEANING**

- A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.
  2. Do not burn scrap on project site.
  3. Do not burn scraps that have been pressure treated.
  4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave 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 06 4100  
ARCHITECTURAL CASEWORK**

**PART 1- GENERAL****1.01 SUMMARY**

- A. Section Includes:
  - 1. Special fabricated cabinet units.
  - 2. Plastic laminate countertops.
  - 3. Shop finishing.
  - 4. Cabinet hardware.
  - 5. Shelf hardware
- B. Related Sections:
  - 1. Division 01: Administrative, procedural, and temporary work requirements.

**1.02 REFERENCES**

- A. Architectural Woodwork Institute (AWI) - Architectural Woodwork Quality Standards, where specifically noted in these Specifications and subject to exceptions cited. Where conflict or confusion between these specifications and the AWI Standards, the **most** restrictive, not the least restrictive shall apply.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- C. BHMA A156.9 - Cabinet Hardware

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Submittals for Review:
  - 1. Shop Drawings:
    - a. Include dimensioned plan, sections, elevations, and details, including interface with adjacent work.
    - b. Designate wood species and finishes.
  - 2. Samples:
    - a. 6 x 6 inch plastic laminate samples showing available colors and finishes, or if colors selected on drawing, for final verification.
    - b. Each hardware component.
    - c. 12 x 12-inch panel product samples.

**1.04 QUALITY ASSURANCE**

- A. Fabricator Qualifications:
- B. Mockup:
  - 1. Size: Base and wall cabinet, minimum 36 inches wide. with drawer and doors as indicated.
  - 2. Show: Cabinets, countertops, and hardware.
  - 3. Locate where directed.
  - 4. Approved mockup may remain as part of the Work.
  - 5. Mock-up shall be reviewed and approved prior to fabrication and installation of the millwork. Coordinate with Architect and Owner for review of the Mock-up.
- C. Pre-Installation Conference:
  - 1. Convene 2 weeks prior to beginning work of this Section.
  - 2. Attendance: Architect, Owner, Contractor installer, and related trades.
  - 3. Review, discuss and resolve:
    - a. Critical dimensions.
    - b. Product delivery and storage.
    - c. Staging and sequencing.

- d. Protection of completed work.

### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver materials until proper protection can be provided, and until needed for installation.
- B. Do not deliver materials until the humidity levels in the building can be maintained at a level that will not cause damage to the millwork components

### 1.06 PROJECT CONDITIONS

- A. Environmental Requirements: HVAC system complete and operational for minimum 7 days prior to installation of cabinets.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers - Plastic Laminate:
  - 1. Formica Corp. ([www.formica.com](http://www.formica.com))
  - 2. Nevamar Co. ([www.nevamar.com](http://www.nevamar.com))
  - 3. Wilsonart LLC ([www.wilsonart.com](http://www.wilsonart.com))
- B. NOTE: Substitutions for alternate manufacturers will be considered if submitted PRIOR to BID DATE as required by the Instructions to Bidders and the Supplemental Instructions to Bidders.

### 2.02 MATERIALS

- A. Panel Products:
  - 1. Provide millwork or casework plywood cores of Hardwood Plywood "veneer core" with no-added Urea Formaldehyde adhesives.
  - 2. Graded in accordance with AWI 300 Materials requirements for quality grade specified.
  - 3. Exposed and semi-exposed veneers: White Oak species, quartersawn cut, of quality suitable for transparent finish.
  - 4. Use 3/4 inch thick, 7-ply closed-grain plywood typical unless noted otherwise.
  - 5. Use 1/4 inch thick closed-grain plywood at cabinet backs and drawer bottoms.
  - 6. **No MDF, IDF or particleboard** of any type will be accepted for **any component** of casework or countertop and will result in the casework being rejected by the Architect and the Owner.
    - a. The above specifically excludes the provisions of Sections 3.4.1.18 & 3.4.1.19 of AWI 0641-2019.
  - 7. Cores shall be as specified and **NOT** manufacturer's/supplier's choice.
- B. Plastic Laminate: ISO 4586.
  - 1. Horizontal surfaces: HPDL
    - a. Work Surface: HPDL
    - b. Backing sheet: Compatible with face material.
    - c. Other exposed surfaces: HPDL.
  - 2. Vertical surfaces: HPDL.
    - a. Backing sheet: Compatible with face material.
    - b. Cabinet liner: Grade CLS.
    - c. Other exposed surfaces: HPDL.
  - 3. Colors: as selected on the drawings.
  - 4. Finish: Matte.

### 2.03 ACCESSORIES

- A. Fasteners: Type and size as required by conditions of use.
- B. Adhesives:
  - 1. Waterproof, water-based type, compatible with backing and laminate materials.
- C. Joint Sealers: Specified in Section 07 9200.

**2.04 CABINET HARDWARE AND ACCESSORIES**

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for specific items specified in Division 8 Section "Finish Hardware".
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- E. Catches: Magnetic catches, BHMA A156.9 or B03141 Push-in magnetic catches, BHMA A156.9, B03131.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013; metal.
- H. Drawer Slides: BHMA A156.9, B05091.
  - 1. Heavy Duty (Grade 1): Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
  - 2. Box Drawer Slides: Grade 1; for drawers not more than 6 inches high and 24 inches wide.
  - 3. File Drawer Slides: Grade 1 HD-100; for drawers more than 6 inches high or 24 inches wide.
  - 4. Pencil Drawer Slides: Grade 2; for drawers not more than 3 inches high and 24 inches wide.
  - 5. Keyboard Slides: Grade 1; for computer keyboard shelves.
  - 6. Trash Bin Slides: Grade 1HD-100; for trash bins not more than 20 inches high and 16 inches wide.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Grommets for Cable Passage through Countertops: 1-1/4-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA
  - 1. A156.18 for BHMA finish number indicated.
    - a. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
    - b. Satin Stainless Steel: BHMA 630.
    - c. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

**2.05 SHELF HARDWARE**

- A. At Closet Shelving noted in documents provide heavy duty Standards and Shelf Clips as follows
  - 1. Standards: Knappe and Vogt 255ZC in 96 inch lengths or as indicated on the drawings.
    - a. Install at not greater than 16 inch oc. and within 1-1/2 inch of the shelf edges, minimum 4 per shelf.
  - 2. Clips: Knappe and Vogt 256P
  - 3. Finish: Zinc

**2.06 FABRICATION**

- A. Cabinets - Plastic Laminate Finish:
  - 1. Quality: AWI 0641 Architectural Wood Caswood, Premium Grade.
  - 2. Type: Flush overlay with 5/8 inch horizontal and vertical reveals.
  - 3. Semi-exposed surfaces: Melamine laminates.
  - 4. Fit exposed and semi-exposed panel edges with matching laminate edging.
  - 5. Fabricate drawer bodies to full depth of drawer fronts less 1/2 inch.

6. Drawer bodies shall be fabricated of solid wood as detailed and **not** at Manufacturer's option.
- B. Plastic Laminate Countertops:
  1. Quality: AWI 1236 Countertops, Premium Grade.
  2. Fabricate from panel product with lumber fronts.
  3. Locate end joints centered or symmetrical. Join sections with concealed clamp fasteners. Locate plastic laminate butt joints minimum 2 feet away from sinks.
  4. Provide holes and cutouts for mounting of sinks, trim, and accessories.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Prior to installation, condition cabinets to average humidity that will prevail after installation.

#### **3.02 INSTALLATION**

- A. Install in accordance with AWI 0620 Finish Carpentry/Installation, Premium Grade requirements.
- B. Set plumb, rigid and level.
- C. Scribe to adjacent construction with maximum 1/8-inch gaps.
- D. Adhere countertops, splashes, and skirts with beads of adhesive.
- E. Fill joints between tops and splashes with sealant as specified in Section 07 9200, finish flush.

**END OF SECTION**

**SECTION 07 2100  
THERMAL INSULATION**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Batt insulation in exterior ceiling and roof construction.
- B. Batt insulation for filling perimeter window and door shim spaces.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 4000 - Cold-Formed Metal Framing.
- B. Section 05 440 - Cold-Formed Metal Trusses
- C. Section 06 1000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.
- D. Section 07 4113 - Metal Roof Panels.

**1.03 DEFINITIONS**

- A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
  - 1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
  - 2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
  - 3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

**1.04 REFERENCE STANDARDS**

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.
- H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Shop Drawings: Submit drawings that indicate location of joint or termination detail conditions.



- D. Samples for Verification: Submit two samples 6 by 6 inches in size illustrating insulation and \_\_\_\_\_.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

## 1.06 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 Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.
- B. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.
- C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.
- D. Insulation in Cold-Formed Truss Framed Roof Structure: Batt insulation with integral 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. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
  - 6. Board Edges: Square.
  - 7. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
  - 8. Products:
    - a. DuPont de Nemours, Inc: [building.dupont.com/#sle](http://building.dupont.com/#sle).
    - b. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
  - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
  - 6. Board Size: 48 inch by 96 inch.
  - 7. Board Thickness: 1-3/4 inch.
  - 8. Board Edges: Shiplap, at long edges.
  - 9. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
  - 10. Products:
    - a. DuPont de Nemours, Inc: [building.dupont.com/#sle](http://building.dupont.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### 2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
  - 1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
  - 3. Formaldehyde Content: Zero.
  - 4. Thermal Resistance: R-value as indicated on Drawings.
  - 5. Facing: Unfaced.
  - 6. Products:
    - a. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
    - c. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
    - d. \_\_\_\_\_.

## **2.04 ACCESSORIES**

- A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
  - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
  - 2. Width: Are required 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 EXTERIOR WALLS**

- A. Adhere 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
  - 1. Tape seal joints between sheets.
  - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
  - 1. Full bed 1/8 inch thick.
- C. Install boards horizontally on walls.
  - 1. Place boards to maximize adhesive contact.
  - 2. Install in running bond pattern.
  - 3. Butt edges and ends tightly to adjacent boards and protrusions.
- D. Extend boards over expansion joints, unbonded to wall on one side of joint.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Place 6 inches 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.
- G. Tape insulation board joints.

### **3.03 BOARD INSTALLATION AT CAVITY WALLS**

- A. Apply adhesive to back of boards:
  - 1. Full bed 1/8 inch thick.
- B. Install boards to fit snugly between wall ties.
- C. Install boards horizontally on walls.
  - 1. Place boards to maximize adhesive contact.
  - 2. Install in running bond pattern.

- 3. Butt edges and ends tightly to adjacent boards and protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- E. Place 6 inches 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.

#### **3.04 BOARD INSTALLATION OVER STEEP SLOPE ROOF SHEATHING OR ROOF STRUCTURE**

- A. Installation of board insulation over steep slope roof structure or roof sheathing, see Section 06 1000.

#### **3.05 BATT INSTALLATION**

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior roof and ceiling 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.
- E. Tape insulation batts in place.
- F. At metal framing, place vapor retarder; lap and seal sheet retarder joints over face of member

#### **3.06 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.

#### **3.07 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to Substantial Completion.

**END OF SECTION**

**SECTION 07 2113.13  
FOAM BOARD INSULATION**

**PART 1 – GENERAL****1.01 SUMMARY****A. SECTION INCLUDES**

1. Provide and install the following:
  - a. Extruded Polystyrene continuous insulation for cavity wall application.
  - b. Fasteners and Hardware or other method as recommended by continuous insulation manufacturer.
2. The complete wall system shall include the following:
  - a. Natural stone or face brick veneer over load bearing or non-load bearing Concrete Masonry Unit (CMU) cavity wall construction.
  - b. Continuous air and water resistive barrier system applied to the exterior face of the CMU wall installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations and capable of withstanding positive and negative combined wind, stack, and HVAC pressures on the envelope without damage or displacement.
  - c. Extruded polystyrene continuous insulation preliminarily secured to CMU adhesively attached, and permanently secured behind veneer.
  - d. Saming to firestop the perimeter of door and window penetrations through wall.
  - e. Saming and sealant for sealing gaps between exterior wall and floor edge, perimeter fire containment system.
3. All joints, penetrations, and gaps of the air barrier wall system shall be made water and air tight.

**B. RELATED SECTIONS**

1. The items listed are not included in this Section, but are specified in the Section listed:
2. Section 04 2000 - Unit Masonry
3. Section 04 4313 - Stone Masonry Veneer
4. Section 04 7200 - Cast Stone Masonry
5. Section 05 5000 - Metal Fabrication, (lintels, shelf angles, and masonry support)
6. Section 07 2100 - Thermal Insulation
7. Section 07 6200 - Sheet Metal Flashing and Trim
8. Section 07 8400 - Firestopping
9. Section 07 9200 - Joint Sealants

**1.02 REFERENCES****A. REFERENCE STANDARDS**

1. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use American Society for Testing of Materials (ASTM)
  - a. ASTM A272: Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
  - b. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
  - c. ASTM C578: Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
  - d. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
  - e. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
  - f. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.
  - g. ASTM E119: Standard Test Methods for Fire Tests of Building Constructions and Materials.

- h. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
- i. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- 2. International Code Council Evaluation Service (ICC-ES)
  - a. AC 71: Acceptance Criteria for Foam Plastic Sheathing Panels Used as Water Resistive Barriers.
- 3. National Fire Protection Association (NFPA)
  - a. NFPA 285: Standard Fire Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

### 1.03 ADMINISTRATIVE REQUIREMENTS

#### A. COORDINATION

- 1. Coordinate installation of insulation and accessories with veneer system, air barrier membrane, and other moisture protection work.

#### B. PREINSTALLATION MEETINGS

- 1. Convene a meeting of involved sub-contractors a minimum of two weeks prior to commencing Work described in this Section.
- 2. Attendance is required by representatives of related trades including Owner's Representative, Contractor, Architect, Installer, Membrane System Manufacturer, Roofing and Subcontractor, mechanical subcontractor, electrical contractor, and all subcontractors who have materials penetrating the air barrier membrane system or finishes covering the membrane system. Manufacturer's Representative is available upon request with minimum two-week notice.
- 3. Contractor shall notify Architect at least 14 days prior to time for meeting.
- 4. Contractor shall record minutes of meeting and distribute to attending parties.
- 5. The agenda shall include at a minimum:
  - a. Materials proposed for use.
  - b. Verification of eligibility for any warranty.
  - c. Sequence of construction.
  - d. Coordination with substrate preparation, condition, and pretreatment.
  - e. Compatibility of materials.
  - f. Air barrier requirements and installation.
  - g. Mechanical and electrical requirements and installation.
  - h. Minimum curing period.
  - i. Special details.
  - j. Mockups.
  - k. Air leakage and adhesion testing and inspection.
  - l. Air barrier protection and repair.
  - m. Work scheduling that covers air barrier coordination with installation of adjacent and covering materials.
  - n. Review and approval of all glazing applications.
  - o. Roofing installation.

### 1.04 SUBMITTALS

- A. See Section 01 3000 – Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturers' data on each type of product furnished including:
  - 1. Preparation instructions and recommendations.
  - 2. Technical data and tested physical and performance properties of products.
  - 3. Storage, handling requirements, and recommendations.
- C. Shop Drawings (project-specific)
  - 1. Show locations and extent of cladding attachment and cladding. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside

- corners, terminations, flashing transition assemblies, and tie-ins with adjoining construction.
- 2. Include details of interfaces with other materials that form part of building enclosure.
- D. Samples: Submit product minimum three samples of the following:
  - a. Extruded Polystyrene Insulation minimum three inches by three inches.
  - b. Any fasteners, hardware, and adhesives recommended by manufacturer.
- E. Certificates:
  - 1. Submit documentation signed by Manufacturer that products meet Quality Assurance Certification requirements of this Section.
- F. MANUFACTURER'S INSTRUCTIONS
  - 1. Provide Manufacturer's installation instructions for each product specified in this Section.
- G. QUALIFICATION STATEMENTS
  - 1. Provide documentation of required Quality Assurance Qualifications for Manufacturers and Installers for all products in wall assembly as required in this Section.
- H. WARRANTY DOCUMENTATION
  - 1. Submit sample warranties as required by this Section.

### 1.05 QUALITY ASSURANCE

- A. QUALIFICATIONS
  - 1. MANUFACTURERS
    - a. Insulation systems shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of insulation materials. Obtain continuous insulation material through one source from a single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past five years.
  - 2. INSTALLERS
    - a. The installation work of this section shall be performed by one entity, an experienced contractor that employs installers and supervisors who are trained and authorized by manufacturer, with a minimum two years' record of successful installations on projects of similar scope.
- B. CERTIFICATIONS
  - 1. Provide Manufacturer's written certification that cladding attachment system components are compatible.
  - 2. Provide Manufacturer's written certification that assembly components are compatible with all adjacent materials that come into contact during construction and throughout the life of the building.
  - 3. Provide Manufacturer's written certification that products are for the intended purpose as described in this Section.
- C. SUSTAINABILITY STANDARDS CERTIFICATIONS
  - 1. Minimum recycled content Certified by independent third-party testing.
  - 2. Environmental Product Declaration validated by Underwriters Laboratories.
- D. MOCK-UPS
  - 1. Construct a wall system sample panel minimum 8 feet long x 8 feet high that includes CMU Back-up, air and water barrier, extruded polystyrene (XPS) continuous insulation, insulation fastening methods, through-wall flashing, weeps/ venting, termination bars, drip edges, sealants, cladding attachment system, and veneer. The mock-up shall also include a window, storefront, or door frame, and sill opening transition assembly detailed with lintel, head, and sill flashings, and end dams to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

2. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
3. Include transitions to roofing membrane, building corner condition, and foundation wall.
4. Architect approval of mockup is required. If it is determined that mockup does not comply with requirements, affected details must be reconstructed until mockups are approved.
5. Locate as directed and remove upon review and approval.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store products in Manufacturer's unopened packaging until ready for installation.
- B. Store and protect products in accordance with manufacturer's instructions. Store in a dry area and protect from water, direct sunlight, flame, and ignition sources.
- C. Remove and replace materials that are damaged.
- D. In the event the extruded polystyrene insulation board becomes wet, wipe dry prior to installation.
- E. In the event the batt or blanket insulation becomes wet, remove it from the jobsite.

#### **1.07 FIELD CONDITIONS**

- A. AMBIENT CONDITIONS
  1. Apply products within the range of ambient and substrate temperatures recommended by manufacturer.
  2. Protect substrates from environmental conditions that affect insulation performance.

#### **1.08 WARRANTY**

- A. MANUFACTURER WARRANTY
  1. Product Warranty
    - a. Provide Manufacturer's standard limited warranty against manufacturing defects.
  2. Provide Manufacturer's Lifetime Limited Warranty for ASTM C578 performance properties including retaining 90% thermal performance for the life of the product.

### **PART 2 – PRODUCTS**

#### **2.01 EXTRUDED POLYSTYRENE INSULATION**

- A. MANUFACTURERS
  1. BASIS-OF-DESIGN: Owens Corning® ([www.owenscorning.com/insulation/commercial](http://www.owenscorning.com/insulation/commercial)) FOAMULAR® 250 XPS or equal product from one of the following:
  2. Other Acceptable Manufacturers: Manufacturer providing products which meets these specifications and approved by Architect prior to bidding.
  3. Substitution Limitations
    - a. The "Basis of Design" products listed in this Section are tested and warranted as a system. The Contractor shall provide the products of the named manufacturers without substitution, unless a written request for an "or equal complete system substitution" has been approved in writing by the Architect. Substitution requests must be accompanied by the following to be considered for substitution:
    - b. Verification that proposed products meet published product performance criteria.
    - c. Verification from the proposed manufacturers of independent third-party listings or engineering judgements that the proposed system substitution meets the requirements.
  4. Substitutions: See Section 01 6000 - Product Requirements.
- B. DESCRIPTION

1. Provide continuous extruded polystyrene insulation unfaced. Each insulation board must be labeled with manufacturer's name, product brand name, ASTM material specification reference, and identification of the third-party inspection agency used for building code qualification.

C. PERFORMANCE/ DESIGN CRITERIA

1. Type IV per ASTM C578 certified by independent third-party testing agency.
2. Compressive Strength: 25 psi, minimum per ASTM D1621
3. Thermal Resistance (180 day real-time aging as mandated by ASTM C578, measured per ASTM C518 at mean temperature of 75F): R-5.0 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.
4. Water Absorption (ASTM C272): Maximum 0.30 percent by volume.
5. Surface Burning Characteristics (ASTM E84): Flame spread less than 25; smoke developed less than 450, certified by independent third-party testing agency.

D. MATERIALS

1. Contains no HCFCs.
2. Zero ozone depleting blowing agent that has warming potential (100 years) of less than 750.
3. Recycled Content: Minimum 20%, certified by independent third party such as SCS Global Services.
4. Provide R-5 per inch of thickness; 1-1/2 inch thick; 48 inch x 96 inch; square edge.

## 2.02 FASTENERS FOR EXTRUDED POLYSTYRENE INSULATION

A. MANUFACTURERS

1. Substitution Limitations
  - a. The Contractor shall provide the products of the named manufacturers without substitution, unless a written request for an "or equal complete system substitution" has been approved in writing by the Architect. Substitution requests must be accompanied by the following to be considered for substitution:
  - b. Verification that proposed products meet published product performance criteria.
  - c. Verification from the proposed manufacturers of independent third-party listings or engineering judgements that the proposed system substitution meets the ASTM E119 (fire resistance), ASTM E2357 (air leakage), and ASTM E331 (water penetration) requirements.

B. PERFORMANCE/ DESIGN CRITERIA

1. Tested per ASTM E331 as part of specified tested wall assembly.
2. Tested per ASTM E2357 as part of specified tested wall assembly.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verify that wall, opening framing, bridging and structural bracing, and other framing support members and anchorage have been installed per requirements of the Project.
- B. Verify adjacent materials are dry and ready to receive insulation.
- C. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify owner's agent and Architect of unsatisfactory preparation in writing before proceeding. Do not proceed with work until unsatisfactory conditions have been corrected.
- D. Installation of products specified in this Section constitutes acceptance of existing conditions and assumption of responsibility for satisfactory performance.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.



### 3.03 INSTALLATION

#### A. EXTRUDED POLYSTYRENE CONTINUOUS INSULATION

1. Verify manufacturer recommended cure time for air and water barrier system before installing continuous insulation board.
2. Install extruded polystyrene (XPS) insulation boards over the exterior gypsum sheathing and air & water resistive barrier layer in accordance with manufacturers' written recommendations.
3. Install XPS insulation board in maximum sizes to minimize joints.
4. Locate joints square to framing members. Center joints over framing. Provide additional framing as necessary.
5. Stagger joints a minimum of one stud space from adjacent joints.
6. Insulation board edges shall be butted together tightly and fit around openings and penetrations. Install square edges to fit square and tight.
7. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.
8. Apply single layer of insulation boards to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
9. Fasten XPS insulation to exterior face of CMU using compatible adhesive] per manufacturer's written instructions.
  - a. Compatible Adhesive
    - 1) Apply compatible adhesive to sheathing & air barrier, per adhesive manufacturer, air barrier manufacturer, and insulation manufacturer recommendations.
    - 2) Install XPS insulation in adhesive while wet.
    - 3) Hold insulation securely in place until adhesion is satisfactory.
    - 4) Application rate and spacing shall be evenly distributed and minimum necessary per jobsite conditions as required by Insulation & Adhesive Manufacturers to hold the continuous insulation in place until cladding attachment system can be installed to permanently secure the insulation board in accordance with [Division 04 42 00, requirements.
10. Install exterior cladding as soon as possible, best within 60 days.

### 3.04 REPAIR

#### A. FILL ERRANT PUNCTURES, PENETRATIONS, AND HOLES

1. If fasteners are removed leaving penetration into the air barrier system beneath, the affected area must be detailed with air barrier sealant.
2. Completely fill the hole with sealant. Fill the hole in the continuous insulation board to full depth making sealant contact with the air and water barrier membrane below the insulation and fully flush with the outer face of the insulation.

### 3.05 CLEANING

- A. Prior to project closeout, remove all related rubbish, excess material, scaffolding, tools, and equipment from the site. Dispose of waste material in a manner approved by applicable jurisdictions.

### 3.06 PROTECTION

- A. Protect insulation from damage due to weather and physical abuse until protected by permanent construction.
- B. If black tape or coatings are installed over the XPS insulation board, cover the black surfaces as soon as possible to avoid damage due to potential solar heat build-up on the black surface.
- C. Do not permit extruded polystyrene insulation board to come in contact with surfaces or temperatures in excess of 165°F.
- D. Touch-up, repair, or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 07 2140  
FOAMED-IN-PLACE MASONRY WALL INSULATION**

**PART 1 - GENERAL****1.01 SUMMARY**

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
  - 1. Foamed-In-Place masonry insulation for thermal resistance values.

**1.02 SUBMITTALS**

- A. See Section 01 3000 – Administration Requirements for submittal procedures.
- B. Product and technical presentation as provided by the manufacturer.
- C. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- D. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CFR 1910 1200.

**1.03 QUALITY ASSURANCE**

- A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
- B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.
- C. Warranty: Upon request, a one year product and installation warranty will be issued by both the manufacturer and installer.
- D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
  - 1. Product must be classified by Underwriters Laboratory ("UL") as to Surface Burning Characteristics
    - a. Surface Burning Characteristics: ASTM E-84

**PART 2 - PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:
  - 1. "Core-Fill 500TM"; Tailored Chemical Products, P.O. Box 4186, Hickory, N.C. 28603,
  - 2. (800) 627-1687.
- B. Other Acceptable Manufacturers: Manufacturers providing products which meet these specifications and approved prior to bidding by the Architect.
- C. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 INSULATING MATERIALS**

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

1. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
2. Combustion Characteristics: Must be noncombustible, Class A building material.
3. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
4. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8 inch wall assembly (ASTM E 90-90).

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION AND PREPARATION**

- A. Application Assemblies:
  1. 8 inch, or 12 inch concrete masonry units
  2. 2 inch cavity or greater

#### **3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION**

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8 inch to 7/8 inch holes drilled into every vertical column of block cells (every 8 inches on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

**END OF SECTION**

**SECTION 07 2627**  
**AIR AND WATER-RESISTIVE BARRIER SPECIFICATION**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. Section includes materials and installation of vapor permeable fluid-applied membrane air and water-resistive barrier over vertical above grade concrete walls, concrete masonry walls, and wall sheathing.
- B. Related Requirements
  1. Section 03 3000: Cast-In-Place Concrete
  2. Section 04 2200: Concrete Unit Masonry
  3. Section 07 6200: Flashing and Sheet Metal
  4. Section 07 9200: Joint Sealants
  5. Section 08 1113 – Hollow Metal Doors and Frames
  6. Section 08 5213: Aluminium Clad Double Hung Wood Windows
  7. Section 08 3300 – Rolling Service Doors
  8. Section 08 3500 – Four Fold Electric Doors
  9. Section 08 3600 – Sectional Overhead Doors
  10. Section 08 4313 - Aluminum-Framed Storefronts

**1.03 DEFINITIONS**

- A. Air Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air Barrier Auxiliary Material: A transitional component that provides air barrier continuity furnished by a source other than the primary air barrier manufacturer.
- D. Air Barrier Assembly: The collection of air barrier materials, accessory and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

**1.04 PRE-INSTALLATION MEETINGS**

- A. Pre-installation Conference
  1. Review air barrier installation requirements and installation details, mock-ups, testing requirements, protection, and sequencing of work.

**1.05 COORDINATION/SCHEDULING**

- A. Coordinate installation of roofing, windows, doors and other wall penetrations to provide a continuous air and water-resistive barrier.
- B. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall.
- C. Provide sill flashing to direct water to the exterior before windows and doors are installed.
- D. Install window and door head flashing immediately after windows and doors are installed.
- E. Install diverter flashings wherever water can enter the assembly to direct water to the exterior.
- F. Install parapet cap flashing and similar flashing at copings and sills to prevent water entry into the wall assembly.
- G. Install cladding within 180 days of air and water-resistive barrier installation.

**1.06 SUBMITTALS**

- A. See Section 01 3000 – Administrative Requirements for submittal procedures.
- B. Manufacturer's specifications, details and product data.
- C. Manufacturer's standard warranty.
- D. Samples for approval as directed by Architect.
- E. Shop drawings of: substrate joints, cracks, flashing transitions, penetrations, corners, terminations, and tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly.

#### **1.07 QUALITY ASSURANCE**

- A. Manufacturer requirements
  - 1. Manufacturer of exterior wall air and water-resistive barrier materials for a minimum of 35 years in North America.
  - 2. Maintain current registered ISO 9001 Certified Quality System and ISO 14001 Certified Environmental Management System
- B. Contractor requirements
  - 1. Knowledgeable in the proper use and handling of manufacturer's materials.
  - 2. Employ skilled mechanics who are experienced and knowledgeable in waterproofing and air barrier application, and familiar with the requirements of the specified work.
  - 3. Provide the proper equipment, manpower and supervision on the job-site to install the air barrier assembly in compliance with the project plans & specifications, shop drawings, and Manufacturer's published specifications and details.
- C. Regulatory Compliance
  - 1. Primary air barrier and joint treatment materials:
    - a. Comply with air barrier material requirements of ASHRAE 90.1 – 2016
    - b. Comply with 2015 and 2018 IBC and IRC requirements for a continuous air barrier
    - c. Comply with air barrier material requirements of 2015 and 2018 IBC, IRC, and IECC
    - d. Comply with requirements of 2015 ICC-ES AC 212
    - e. Liquid-applied flashing for rough openings and sheathing joints: shall comply with AAMA 714
    - f. Self-adhered flashing for rough openings and sheathing joints: shall comply with AAMA 711
- D. Mock-ups
  - 1. Build stand-alone site mock-up or sample wall area on as-built construction to incorporate back-up wall construction, typical details covering substrate joints, cracks, flashing transitions, penetrations, corners, terminations, tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly.

#### **1.08 PRE-CONSTRUCTION TESTING**

- A. Conduct site testing by qualified test agency or building envelope consultant
  - 1. Conduct assembly air leakage testing in accordance with ASTM E783
  - 2. Conduct adhesion testing to substrates in accordance with ASTM D4541
  - 3. Conduct wet sealant compatibility testing in accordance with sealant manufacturer's field quality control test procedure.
  - 4. Notify Architect minimum 7 days prior to testing.

#### **1.09 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90 degrees F (32 degrees C). Store away from direct sunlight.
- C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

- D. Protect and store accessory and auxiliary products in accordance with manufacturer's written instructions.

### **1.10 PROJECT/SITE CONDITIONS**

- A. Maintain ambient and surface temperatures between 40 degrees F (4 degrees C) and 100 degrees F (38 degrees C), during application and drying period, and for minimum 24 hours after application of air and water-resistive barrier materials, unless permitted otherwise by manufacturer.
- B. Provide supplementary heat for installation in temperatures less than 40 degrees F (4 degrees C) or if surface temperature is likely to fall below 40 degrees F (4 degrees C).
- C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

### **1.11 WARRANTY**

- A. Provide manufacturer's standard warranty.

### **1.12 REFERENCE STANDARDS**

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- C. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- E. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2019.
- F. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
- G. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems; 2017.
- H. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- I. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2018.
- J. ISO 9001 - Quality Management Systems — Requirements; 2015, with Amendment (2024).
- K. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.
- L. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

## **PART 2 PRODUCTS**

### **2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Sto Corp.
- B. Obtain primary air barrier and accessory air barrier materials from single source.
- C. Other Acceptable Manufacturers.
  - 1. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- D. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 BASIS OF DESIGN MATERIALS**

- A. Primary Air Barrier Material: Sto Gold Coat – ready-mixed, flexible, roller or spray applied vapor permeable air and water-resistive barrier material
- B. Accessory Materials
  - 1. StoGuard Detail Components for: sealing joints and seams, small penetrations or attachments (scupper, pipe, electrical box) and other static transitions in above grade wall construction, rough opening protection, and counterflashing
  - 2. StoGuard Detail Components for transitions: wall to foundation, dissimilar materials (e.g. CMU to frame wall), wall to floor slab or ceiling, and other detailing in above grade wall construction
    - a. Sto RapidGuard®: one component gun-applied STPE liquid flashing, rough opening protection, joint treatment and transition detailing material
    - b. StoGuard Conformable Membrane: self-adhered membrane flashing, rough opening protection, sheathing joint treatment, and transition detailing material
    - c. Sto Gold Coat with StoGuard Transition Membrane: flexible air and water-resistive barrier coating used to embed flexible membrane material
- C. Auxiliary Materials
  - 1. Wet sealant: compatible sealant for dynamic joints or connections with other air barrier components.
    - a. See Section 07 9200 – Joint Sealants.
  - 2. Sto BTS Xtra: polymer modified portland cement-based lightweight patch and leveling material for prepared concrete and masonry surfaces for leveling up to 1/8 inch (3 mm).
- D. Fluid Applied Block Filler for Masonry
  - 1. StoPrime Block Surfacers HP: acrylic-based block filler for CMU surfaces applied by brush, roller or spray.

### 2.03 PERFORMANCE REQUIREMENTS

- A. Air permeance: ASTM E2178, < 0.004 cfm/ft<sup>2</sup> (0.02 L/s·m<sup>2</sup>) air leakage at 1.57 psf (75 Pa)
- B. Water vapor permeability: ASTM E96 Method B, > 10 perms (572 ng/Pa·s·m<sup>2</sup>) at 7-8 mils DFT
- C. Surface burning: ASTM E84, Flame Spread < 25, Smoke Developed < 100, Class A Building Material
- D. Elongation: ASTM D412, > 200% at 14-15 mil DFT
- E. Tensile Strength: ASTM D412, > 84 psi (579 kPa) at 14-15 mil DFT
- F. Adhesion: joint treatment and primary air barrier material, ASTM D 4541, > 15 psi (103 kPa), or exceeds strength of glass mat facing on glass mat gypsum substrates
- G. Nail Sealability: ASTM D1970, no water penetration after 72 hours at 40°F (4°C)
- H. Resistance to Mold Growth: ASTM D3273, Rating = 10, no growth at 90 days
- I. Accelerated Weathering/Hydrostatic Pressure: ASTM E2570/AATCC 127 (modified), no cracking of the coating or bond failure, no water penetration after cyclic weathering & 5 hour water column (21.5 in [55 cm])
- J. Structural, Racking, Restrained Environmental Conditioning, and Resistance to Water Penetration: ASTM E2570/ E1233/ E72/E331 (par 6.6.3), no water penetration after sequence of 15 minute water sprays at 2.86, 6.24, 12.0, and 15.0 psf (137, 299, 574, and 718 Pa)
- K. Assembly air leakage: ASTM E2357, < 0.04 cfm/ft<sup>2</sup> (0.2 L/s·m<sup>2</sup>) air leakage after conditioning protocol
- L. Fire Performance of Assembly: NFPA 285, meets requirements for use on Types I-IV construction as listed in ICC ESR 1233 and Intertek Design Listings STO/CWP 30-01 and 30-02, and Intertek CCRR-0454
- M. Volatile Organic Compounds: South Coast AQMD Rule 1113, knife grade joint treatments and primary air barrier material < 50 g/L



- N. Water-resistive Barrier: ICC ES AC 212, knife grade joint treatments, self-adhered membrane, and primary air barrier material comply

## **2.04 DESIGN CRITERIA**

- A. Structural (Wind and Axial Loads)
1. Design for maximum allowable deflection normal to the plane of the wall of: L/240. Where cladding dictates stiffer deflection criteria use cladding design criteria for maximum allowable deflection.
  2. Design for wind load in conformance with code requirements.
- B. Moisture Control
1. Prevent the accumulation of water in the wall assembly and behind the exterior wall cladding:
    - a. Minimize condensation within the assembly.
    - b. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).
    - c. Provide corrosion resistant flashing to direct water to the exterior in accordance with code requirements, including: above window and door heads, beneath window and door sills, at roof/wall intersections, floor lines, decks, intersections of lower walls with higher walls, and at the base of the wall.
- C. Air Barrier Continuity: provide continuous air barrier assembly of compatible air barrier components.
- D. Substrates - See Section 04 2000 – Unit Masonry
1. Concrete Masonry Units: provide CMU surfaces in conformance with the applicable building code, and such that a void and pinhole free air barrier is achieved. Provide normal weight units with flush joints (struck flush with the surface).
  2. Concrete: provide concrete in conformance with the applicable building code.
  3. Sheathing:
    - a. Provide frame/sheathing assembly that meets required design wind pressures.
    - b. Provide gypsum sheathing in compliance with ASTM C1177
    - c. Provide Exterior Grade plywood sheathing in conformance with APA-The Engineered Wood Association E30, Engineered Wood Construction Guide
    - d. Provide Exposure 1 OSB (Oriented Strand Board) sheathing in conformance with APA-The Engineered Wood Association E30, Engineered Wood Construction Guide
    - e. Provide cementitious sheathing in compliance with ASTM C1325 Type A and with ICC-ES listing or other nationally recognized product evaluation agency
- E. Mechanical Ventilation: maintain pressurization and indoor humidity levels in accordance with recommendations of ASHRAE (see 2017 ASHRAE Handbook—Fundamentals).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Inspect concrete and concrete masonry surfaces for:
1. Contamination – algae, dirt, dust, efflorescence, form oil, fungus, grease, mildew or other foreign substances.
  2. Surface deficiencies – weak, friable, chalkiness, laitance, bugholes, and spalls.
  3. Cracks – measure crack width and record location of cracks.
  4. Damage or deterioration.
  5. Moisture content and moisture damage – use a moisture meter to determine if the surface is dry enough to receive the air and water-resistive barrier and record any areas of moisture damage or excess moisture.
  6. Flush masonry mortar joints completely filled with mortar.
- B. Inspect sheathing application for compliance with applicable requirement:

1. Exterior Grade and Exposure I wood based sheathing: E30W-2017, Engineered Wood Construction Guide, and the requirements of the applicable building code.
  2. Glass mat faced gypsum sheathing in compliance with ASTM C1177: consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.
  3. Cementitious sheathing – Consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.
- C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air and water-resistive barrier installation. Do not start work until deviations are corrected.

### 3.02 SURFACE PREPARATION

- A. Concrete Masonry
1. Surface must be structurally sound and free of weak or damaged surface conditions such as laitance or spalls. Surface must be clean, dry, frost-free, and free of any bond-inhibiting materials such as dust, dirt, oil, algae, mildew, salts, efflorescence, or any other surface contamination. Mortar joints must be struck flush with the surface.
  2. Remove excess mortar from masonry ties, lintels and shelf angles.
  3. Remove loose or damaged material by water-blasting, sandblasting or mechanical wire brushing. Remove surface contamination such as dirt or efflorescence by chemical or mechanical means. Repair surface defects such as spalls, voids and holes with Sto BTS Xtra (up to 1/8inch [3 mm] thick).
  4. Repair non-structural cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply primary air barrier material over crack by roller or knife at minimum 20 WFT (12 DFT) and allow to dry. Consult a structural engineer for structural cracks.
- B. Concrete
1. Surface must be structurally sound and free of weak or damaged surface conditions such as laitance, bugholes, or spalls. Surface must be clean, dry, frost-free, and free of any bond-inhibiting materials such as dust, dirt, oil, form release, algae, mildew, salts, efflorescence, or any other surface contamination.
  2. Remove projecting fins, ridges, form ties, and high spots by mechanical means.
  3. Remove loose or damaged material by water-blasting, sandblasting or mechanical wire brushing. Remove form release by chemical or mechanical means. Repair surface defects such as honeycombs, pitting, spalls, voids or holes with Sto BTS Xtra (up to 1/8 inch [3 mm] thick).
  4. Repair non-structural cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply primary air barrier material over crack by roller or knife at minimum 20 WFT (12 DFT) and allow to dry. Consult a structural engineer for structural cracks.
- C. Sheathing
1. Remove and replace damaged sheathing.
  2. Spot surface defects such as over-driven fasteners, knot holes, or other voids in sheathing with knife grade joint treatment material or air and water-resistive barrier coating.

### 3.03 INSTALLATION

- A. Air and water-resistive barrier installation over Exterior or Exposure I Wood-Based Sheathing (Plywood and OSB), Glass Mat Faced Gypsum Sheathing in compliance with ASTM C1177, Cementitious sheathing in compliance with ASTM C1325 Type A, concrete, and concrete masonry (CMU) wall construction
- B. Coordinate work with other trades to ensure air barrier continuity with connections at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roofing.

- C. Transition Detailing: detail transition areas with appropriate StoGuard Detail Component. Refer to StoGuard Detail Booklets at [www.stocorp.com](http://www.stocorp.com).
- D. Rough opening protection.
  - 1. Install rough opening protection. Refer to StoGuard Detail Booklets at [www.stocorp.com](http://www.stocorp.com).
- E. Sheathing joints
  - 1. Install joint treatment over sheathing joints. Refer to StoGuard Detail Booklets at [www.stocorp.com](http://www.stocorp.com).
- F. Air and Water-resistive Barrier Coating.
  - 1. Apply coating uniformly by airless spray or roller to achieve a VOID and PINHOLE FREE surface on all substrates. Back roll when applying by airless spray on CMU and OSB substrates.
  - 2. Glass Mat Gypsum: apply one coat at minimum 10 mils WFT
  - 3. Plywood: apply one coat at minimum 10 mils WFT
  - 4. Cementitious Sheathing: apply one coat at minimum 10 mils WFT
  - 5. OSB: apply one or two coats at minimum 20 mils WFT. If applied by roller, apply two coats. Touch up any bare spots and raised OSB strands.
  - 6. CMU: apply two or three coats at minimum 20-60 mils WFT.
  - 7. Concrete: apply one coat at minimum 10 mils WFT

### 3.04 FIELD QUALITY CONTROL

- A. Owner's qualified testing agency or building envelope consultant shall perform inspections and tests.
- B. Inspections: air barrier materials are subject to inspection to verify compliance with requirements.
  - 1. Condition of substrates and substrate preparation.
  - 2. Installation of primary air barrier material, accessory materials, and compatible auxiliary materials over structurally sound substrates and in conformance with architectural design details, contractor's shop drawings, project mock-up, and manufacturer's written installation instructions.
  - 3. Air barrier continuity and connections without gaps and holes at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roofing.
- C. Tests: air barrier materials and assembly are subject to tests to verify compliance with performance requirements
  - 1. Qualitative air leakage test: ASTM E1186
  - 2. Quantitative air leakage test: ASTM E779, E783, and E1827
  - 3. Adhesion test: ASTM D4541
  - 4. Qualitative adhesion and compatibility testing: wet sealant manufacturer's field quality control adhesion test
- D. Repair non-conforming substrates and air barrier material installation to conform with project requirements.
- E. Take corrective action to repair and replace, or reinstall materials, and to seal openings, gaps, or other sources of air leakage to conform with project performance requirements.

### 3.05 PROTECTION AND CLEANING

- A. Protect air barrier materials from damage during construction caused by wind, rain, freezing, continuous high humidity, or prolonged exposure to sun light.
- B. Protect air barrier materials from damage from trades, vandals, and water infiltration during construction.
- C. Repair damaged materials to meet project specification requirements.

- D. Clean spills, stains, soiling from finishes or other construction materials that will be exposed in the completed work with compatible cleaners.
- E. Remove all masking materials after work is completed.

**END OF SECTION**

**SECTION 07 4113  
METAL ROOF PANELS - PETERSEN ALUMINUM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Preformed aluminum panels.
- B. Attachment system.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 3100 - Steel Deck.
- B. Section 05 4400 - Cold-Formed Metal Trusses.

**1.03 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 B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2021).
- F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).
- G. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2018).
- H. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems; 2016 (Reapproved 2022).
- I. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
- C. Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
  - 1. Include typical panel joint in sample.
  - 2. Include typical fastening detail.
- D. Test Reports: Indicate compliance of metal roofing system with specified requirements.
- E. Installer's qualification statement.
- F. Executed warranty.
- G. Specimen warranty.

**1.05 QUALITY ASSURANCE**

- A. 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. See Section 01 4000 - Quality Requirements for additional requirements.

- B. Provide mock-up of 10 sq ft, including underlayment, eave protection membrane, and associated flashings.
- C. Locate as directed by Architect.
- D. Mock-up may remain as part of the work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Architectural Metal Roof Panel Manufacturers:
  - 1. Petersen Aluminum Corporation; Snap-On Standing Seam Panel: [www.pac-clad.com/#sle](http://www.pac-clad.com/#sle).
- B. Metal Soffit Panel Manufacturers:
  - 1. Petersen Aluminum Corporation; Flush Soffit: [www.pac-clad.com/#sle](http://www.pac-clad.com/#sle).

#### **2.02 OTHER ACCEPTABLE MANUFACTURERS**

- A. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- B. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.03 PERFORMANCE REQUIREMENTS**

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
  - 1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length (L) when tested in accordance with ASTM E1592.
    - a. Dead Loads: Weight of roofing system.
    - b. Live Loads: As required by ASCE 7.
  - 2. System Performance: Complete and weathertight; tested and approved in accordance with ASTM E1592.
  - 3. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested in accordance with ASTM E1680.
  - 4. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
  - 5. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

#### **2.04 METAL ROOF PANELS**

- A. Description: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Preformed panels with factory-applied finish.
  - 1. Aluminum Panels:
    - a. Alloy and Temper: Aluminum complying with ASTM B209/B209M; temper as required for forming.
    - b. Thickness: Minimum 20 gauge, 0.032 inch.
  - 2. Profile: Standing seam, with minimum 1-inch seam height; concealed fastener system for snap-on application of matching standing seam batten.
  - 3. Texture: Smooth.

4. Width: Maximum panel coverage of 16 inches.
- C. Metal Soffit Panels:
1. Profile: Style as indicated, with venting provided.
  2. Material: Precoated aluminum sheet, 20 gauge, 0.032 inch minimum thickness.
  3. Perforation Pattern: As selected by Architect from manufacturer's standard line.
  4. Color: As selected by Architect from manufacturer's standard line.

## 2.05 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

## 2.06 FABRICATION

- A. Panels: Provide factory- or field-fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

## 2.07 FINISHES

- A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat metal coil-coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil-coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss to match sample.
- B. Color: As selected by Architect from manufacturer's standard range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

## 2.08 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
1. Downspouts: Closed face, rectangular profile.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of closed-cell synthetic rubber, neoprene, or PVC.
- C. Sealants:
1. Exposed Applications: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  2. Concealed Applications: Noncuring butyl or tape sealant.
  3. Seams: Factory-applied, nonskinning, nondrying type.
- D. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable release film and polyolefin top surface with anti-skid coating.
1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for self-adhesive sheet.
  2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
  3. Low-Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
  4. Liquid Water Transmission: Passes ASTM D4869/D4869M.
  5. Functional Temperature Range: From minus 70 degrees F to 212 degrees F.
  6. Product:
    - a. Petersen Aluminum Corporation; PAC-CLAD HT.
    - b. Substitutions: Not permitted.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Do not begin installation of preformed metal roof panels until substrates are properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**3.02 PREPARATION**

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure completed roof will be free of leaks.
- B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- D. Protect surrounding areas and adjacent surfaces from damage during execution of this work.
- E. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

**3.03 INSTALLATION**

- A. Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place, allowing for thermal and structural movement.
  - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
  - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, rib closures, ridge closures, and similar roof accessory items.
- C. Install underlayment before installing preformed metal roof panels; apply from eaves to ridge in shingle fashion, overlapping horizontal joints at least 2 inches and side and end laps at least 3 inches; offset seams.
- D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
  - 1. Provide concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.

**3.04 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

**3.05 PROTECTION**

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

**END OF SECTION**



**SECTION 07 6200  
SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, and other items as required.
- B. Sealants for joints within sheet metal fabrications.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 4113 - Metal Roof Panels

**1.03 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2015a (Reapproved 2021).
- E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- G. CDA A4050 - Copper in Architecture - Handbook; current edition.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

**1.06 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 5 years of documented experience.

**1.07 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. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with silicone modified polyester coating.
  - 1. Color: to match metal roof panels.

- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed 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; 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 long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- G. Fabricate flashings to allow toe to extend 2 inches over roofing panels. Return and brake edges.

## **2.03 FLASHING**

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

## **2.04 ACCESSORIES**

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Underlayment: ASTM D2178/D2178M, glass fiber roofing felt.
- C. Slip Sheet: Rosin-sized sheathing paper.
- D. Primer Type: Zinc chromate.
- E. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.
- F. Concealed Sealants: Non-curing butyl sealant.
- G. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- H. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify roof openings, 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, 0.015 inch.

### **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.

**3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

**END OF SECTION**

**SECTION 07 8400  
FIRESTOPPING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Firestopping systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.
- B. Section 04 2000 - Unit Masonry,

**1.03 REFERENCE STANDARDS**

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023b.
- F. 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; 2023a.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- H. ITS (DIR) - Directory of Listed Products; Current Edition.
- I. FM (AG) - FM Approval Guide; Current Edition.
- J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2017).
- K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- L. UL (DIR) - Online Certifications Directory; Current Edition.
- M. UL (FRD) - Fire Resistance Directory; Current Edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Certificate from authority having jurisdiction indicating approval of materials used.
- H. Installer's qualification statement.

**1.05 QUALITY ASSURANCE**

- A. Fire Testing: Provide firestopping assemblies of designs that provide the required fire ratings when tested in accordance with appropriate methods.

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](http://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. Installer Qualifications: Company specializing in performing the work of this section and:
1. Licensed by local authorities having jurisdiction (AHJ).

#### **1.06 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.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Firestopping Manufacturers:
1. 3M Fire Protection Products: [www.3m.com/firestop/#sle](http://www.3m.com/firestop/#sle).
  2. Hilti, Inc: [www.hilti.com/#sle](http://www.hilti.com/#sle).
  3. Specified Technologies Inc: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
  4. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 MATERIALS**

- A. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Fire Ratings: Refer to drawings for required systems and ratings.

#### **2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS**

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
  2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
- B. 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.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. 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.
1. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
  2. Watertightness: Provide systems that have been tested to show W Rating as indicated.
  3. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

#### **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.

### **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.
- C. Install backing materials to prevent liquid material from leakage.

#### **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 FIELD QUALITY CONTROL**

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

#### **3.05 CLEANING**

- A. Clean adjacent surfaces of firestopping materials.

#### **3.06 PROTECTION**

- A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

**SECTION 08 1113  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Thermally insulated hollow metal doors with frames.
- D. Tornado-resistant hollow metal doors and frames.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9000 - Painting and Coating.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SDI: Steel Door Institute.
- G. UL: Underwriters Laboratories.

**1.04 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- F. 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; 2021a.
- G. 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.
- H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- L. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

- M. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms; 2021.
- N. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.
- O. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; 2020.
- P. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- Q. ITS (DIR) - Directory of Listed Products; Current Edition.
- R. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.
- S. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- T. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- U. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
- V. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- W. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- X. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- Y. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
- Z. UL (DIR) - Online Certifications Directory; Current Edition.
- AA. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - 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.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

#### **1.06 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.

#### **1.07 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.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:
  - 1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 2. Republic Doors, an Allegion brand: [www.republicdoor.com/#sle](http://www.republicdoor.com/#sle).
  - 3. Steelcraft, an Allegion brand: [www.allegion.com/#sle](http://www.allegion.com/#sle).



4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Tornado-Resistant Hollow Metal Doors and Frames:
1. Krieger Specialty Products: [www.kriegerproducts.com/#sle](http://www.kriegerproducts.com/#sle).
  2. Premier Steel Doors and Frames: [www.trustpremier.com/#sle](http://www.trustpremier.com/#sle).
  3. Republic Doors, an Allegion brand: [www.republicdoor.com/#sle](http://www.republicdoor.com/#sle).
  4. Substitutions: See Section 01 6000 - 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. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
  7. 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.
  8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.
- 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 2 - Heavy-duty.
    - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
  2. Door Core Material: Vertical steel stiffeners with fiberglass batts.
    - 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 11.
  4. Door Thickness: 1-3/4 inches, nominal.
- B. Interior Doors, Non-Fire-Rated:
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 Flush and two panel as indicated.

- d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
- e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
- 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
- 3. Door Thickness: 1-3/4 inches, nominal.
- C. 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, minimum.
    - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
  - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
  - 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - a. Attach fire rating label to each fire rated unit.
  - 4. Door Thickness: 1-3/4 inches, nominal.
- D. Tornado-Resistant Doors: Provide fire-rated door construction as indicated for door Type \_\_\_\_ , Fire-Rated Doors, and the following hurricane resistant door requirements.
  - 1. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
    - a. Design Wind Loads: Comply with requirements of authorities having jurisdiction.
    - b. Wind-Borne Debris Resistance: Door and frame components shall have FLA (PAD) approval, Miami (APD) approval, or UL (DIR) approval for Large and Small Missile impact and pressure cycling at design wind loads.
  - 2. Tornado Shelter Application: Comply with ICC 500 standard.
    - a. Commercial: Designed and tested to comply with FEMA P-361 community shelter door assembly guidelines.
  - 3. 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: 16 gauge, 0.053 inch, minimum.
    - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
  - 4. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  - 5. Door Thickness: 1-3/4 inches, nominal.
  - 6. Door Finish: Factory primed and field finished.

#### **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. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
  - 1. Fire Rating: Same as door, labeled.
  - 2. Frame Finish: Factory primed and field finished.
- E. Tornado-Resistant Door Frames: With same tornado resistance as door; full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.

1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
  2. Frame Finish: Factory primed and field finished.
- F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- H. Frames Wider than 48 inches: 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.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
1. Fire-Rated Frames: Comply with fire rating requirements indicated.

## **2.06 ACCESSORIES**

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
- B. Glazing: As specified in Section 08 8000, factory installed.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- E. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- F. Silencers: Drilled to receive resilient rubber, fitted into drilled hole; provided by Section 08 7100; three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- G. 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 7100.

F. Comply with glazing installation requirements of Section 08 8000.

**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 measured with straight edge, corner to corner.

**3.05 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**3.06 SCHEDULE**

- A. Refer to Door and Frame Schedule on the drawings.

**END OF SECTION**

**SECTION 08 3323  
OVERHEAD COILING DOORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior coiling doors.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 7100 - Door Hardware: Cylinder cores and keys.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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. Installer's qualification statement.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- G. Specimen warranty.

**1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Overhead Coiling Metal Doors:
  - 1. Cornell Iron Works, Inc: [www.cornelliron.com/#sle](http://www.cornelliron.com/#sle).
  - 2. Raynor Garage Doors: [www.raynor.com/#sle](http://www.raynor.com/#sle).
  - 3. The Cookson Company: [www.cooksondoor.com/#sle](http://www.cooksondoor.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 COILING DOORS**

- A. Exterior Coiling Doors Type G3: Aluminum slat curtain.
  - 1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components.
  - 2. Sandwich Slats: Manufacturer's standard, with core of foamed-in-place polyurethane insulation; minimum R-value of 4.88.
  - 3. Nominal Slat Size: 2 inches wide by required length.

4. Finish: Anodized, Clear color.
5. Guide, Angles: Stainless steel.
6. Hood Enclosure: Manufacturer's standard; aluminum.
7. Manual hand chain lift operation.

### **2.03 MATERIALS**

- A. Metal Curtain Construction: Interlocking slats.
  1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
  2. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
  3. 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.
  4. Double-Wall Aluminum Slats: Minimum thickness; manufacturer's standard for door size and application, made from ASTM B221 (ASTM B221M), aluminum alloy Type 6063.
- B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.
- C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
  1. Stainless Steel: ASTM A 666, Type 304, rollable temper.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
  1. Manufacturer's Standard Minimum thickness.
  2. Prepare for site painted finish.
- E. Lock Hardware:
  1. Cylindrical Locking Mechanism: Latchset lock cylinder, specified in Section 08 7100.
  2. Latch Handle: Manufacturer's standard.
  3. Manual Chain Lift: Provide padlockable chain keeper on guide.
- 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 nominal force to operate.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that door opening is plumb, header is level, and dimensions are correct.
- C. Notify Architect of any unacceptable conditions or varying dimensions.
- D. Commencement of installation indicates acceptance of substrate and door opening conditions.

### **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. 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.
- C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

**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 3500  
ELECTRIC FOUR FOLD DOORS**

**PART 1 – GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. This Section describes the requirements for providing electric four-fold doors as shown on the Drawings and as specified.
- B. Provide complete operating door assemblies including door sections, guides, hardware, operators, controls, and installation accessories.
- C. Concrete or grout work is specified in Division 3, and is by General Contractor.
- D. Opening framing is specified in Division 5, and is by General Contractor.
- E. Finish painting is specified in Division 9, and is by General Contractor.
- F. Electrical connections, including disconnects, conduit, wire, junction boxes, and field wiring of high or low voltage systems for powered operators and accessories are specified in Division 26, and are by General Contractor.

**1.03 RELATED SECTIONS**

- A. Section 04 2000 - Unit Masonry: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.
- B. Section 05 5000 - Metal Fabrications: Steel frame and supports.
- C. Section 06 1000 – Rough Carpentry: Rough wood framing and blocking for door opening.
- D. Section 07 9200 - Joint Sealants: Perimeter sealant and backup materials.
- E. Section 08 3301 – Insulated Rolling Service Doors
- F. Section 08 3600 – Insulated Sectional Overhead Doors
- G. Section 08 7123 – Commercial Door Operators
- H. Section 08 7100 - Door Hardware: Cylinder locks.
- I. Section 09 9000 - Paints and Coatings: Field painting.
- J. Division 26 – Electrical: - Raceway and Boxes: Empty conduit from control station to door operator.
- K. Division 26 – Electrical: - Wiring Connections: Electrical service to door operator.

**1.04 SUBMITTAL**

- A. See Section 01 3000 – Administrative Requirements for Submittal Procedures.
- B. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- C. Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of electric four-fold door. Provide operating instructions, maintenance information, and electrical rough-in instructions.
- D. Shop Drawing: Show construction details; clearance requirements, metal gauges, finish, electrical requirements, and interface requirements for Work of other Sections of this Specification.
- E. Door Manufacturer shall submit a reference list including names and telephone numbers of five (5) successful installations of this type within the past two (2) years.

**1.05 QUALITY ASSURANCE**



- A. Furnish each electric four fold door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
- B. Door manufacturer shall have at least 10 years experience in manufacturing doors of the type specified.
- C. Furnish electric four-fold door units by one manufacturer for entire Project.
- D. Inserts and Anchorages: Furnish setting drawings and information for installation of anchorage devices. Coordinate delivery with other Work to avoid delay. See concrete and masonry Sections of these Specifications for installation of inserts and anchorage devices.
- E. Design Criteria: The door panels will be designed such that they will not deflect more than L/120 of their span under a minimum windload of 20 pounds per square foot with calculations based on the premise that the door panels are supported on the two non-spanning edges. Loads shall be applied to the vertical perimeter members. Door components shall be designed in accordance with the following specifications of latest adoption:
  - 1. Shapes, Plates, and Bars – AISC Specification for the design, fabrication, and erection of structural steel for buildings.
- F. Submit written certification verifying door assembly ability to support specified loads.

## **PART 2 – PRODUCTS**

### **2.01 BASIS OF DESIGN MANUFACTURER**

- A. Project design is based on Model 41 - Glazed; materials and systems of:
  - 1. Electric Power Door, 522 West 27th Street, Hibbing, MN 55746, 1-800-346-5760, [www.electricpowerdoor.com](http://www.electricpowerdoor.com)
- B. Other Acceptable Manufacturers: Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- C. Substitutions: See Section 01 6000 – Product Requirements.

### **2.02 MATERIALS AND FABRICATION**

- A. General: Comply with the following standards for forms and type of materials for required items of work.
  - 1. Steel Tubing, Electric Welded: ASTM A513
  - 2. Steel Tubing, Structural Welded: ASTM A500 Grade B
  - 3. Structural Shapes and plates: ASTM A36
  - 4. Castings, Cast Iron: ASTM A48
  - 5. Face Sheets: Steel sheet metal, flat, hot rolled, 14 gauge minimum ASTM A1011
  - 6. Glazing: ¼ inch Clear Tempered Glass.
- B. Door Panel Construction: Custom metal fabrications as indicated.
  - 1. Door panel frames will have both horizontal and vertical structural framing, and shall be constructed of standard structural steel, square steel tubing, or rectangular steel tubing sections of ample size and strength for loads and stresses imposed under the specified conditions. Minimum steel tube thickness of the vertical perimeter members shall be 14 gauge. Interior door panel frame members shall be steel tubing spaced at no more than 2 foot-0 inches on center and shall run horizontally. Pan style construction will not be allowed.
  - 2. Door panel frames shall be of welded construction and all joints shall develop the full strength of the framing members. Frame members shall be true to dimension and square in all directions and shall not be bowed, warped, or out of line by more than 1/8 inch in 20 feet.
  - 3. Unglazed portions of the door panel frames shall be sheeted on both sides with 14 gauge flat hot rolled steel which is welded to the door panel frame. All exposed seams of the door panel sheeting shall be caulked with adhesive caulk after fabrication and prior to prime painting.

4. Unglazed portions of the door sections shall be insulated with a minimum of 2 inch of fibrous glass batt-type insulation providing a U-value of .12 or less. The insulating material shall be fitted to cover the entire surface of the door panel between the structural members.
5. Provide ¼ inch clear tempered glass as shown on the drawings.
6. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth.

### 2.03 HARDWARE

- A. Provide hardware necessary for a complete installation. Hardware shall be heavy duty type, including all bolts and fittings for the hardware as follows:
  1. Door Guides:
    - a. For doors up to 16 foot-0 inches wide: The door guides shall be an upside down channel shape fabricated from 3/16 inch thick steel plate. Include wall support brackets. Guides shall be capable of being mounted within 4-1/2 inch of headroom.
  2. Guide Roller Assemblies:
    - a. For doors up to 16 foot-0 inch wide: The door shall have a minimum of two anti-friction bearing guide rollers. The guide rollers shall be of sufficient size to transmit the wind load from the door panel to the steel door guides.
  3. Jamb Hinges: Door shall be complete with shop-applied strap type jamb hinges. Jamb hinge seams must be welded. Each hinge shall be supported on roller bearings. Hinges shall be through bolted on panel. Grease zerk fittings shall be provided on all hinges for greasing hinge pintles.
  4. Hinge Pintles: Jamb hinges shall have continuous 7/8 inch diameter steel pintles the full height of the opening. Pintles shall be stainless steel on exterior mounted applications.
  5. Fold Hinges: Door shall be complete with strap type fold hinges. Fold hinge seams must be welded. Fold hinges shall be of dual capture design and have no less than two (2) shear planes. Fold hinges shall be equipped with a hinge pin with grease chase and grease zerk for lubrication. All fold hinges shall be equipped with two (2) roller bearings.
  6. Weatherstrip: Doors shall be completely weather stripped with snap-on type weather seal at the jambs and head, cloth inserted rubber sweep at sill, combination reversing edge and rubber seal at meeting edges, and sponge rubber and metal astragal between door sections.
  7. Operating Unit: Doors shall be electrically operated. The operator shall be mounted above the door head at top/center, require only 20 inch of headroom, and be furnished complete. The top mounted operator shall consist of a motor, two gear reducers with one common shaft powering both gear reducers (single gear box units will not be allowed) pushbuttons, limit switches, junction box, bearings, arms, and all necessary brackets and fittings to provide a smooth and satisfactory operation. This operator shall have sufficient horsepower to open or close doors against 30 mile-per-hour windload pressure without noise or vibration. The gear reducer will have all gears immersed in all-weather lubricant, sealed in a heavy housing. Operator shall consist of two gear reducers of opposite rotation. The motor shall be high-starting torque, ball bearing, rated at 460 V, 3 phase. The motor must be instantly reversible. The motor control circuit shall incorporate a manual reset overload relay with a positively adjustable rotary type limit switch, using three individual limit switches. Provide an easy emergency disconnect system so door can be manually operated in case of power failure.
    - a. Electric Motors: Motors shall be high-starting torque type, of sufficient horsepower and torque output to move door in either direction from any position and produce an average door travel speed of not less than two-thirds, nor more than one foot per second, without exceeding the rated capacity. Motors shall conform to NEMA standards, have class B insulation, service factor of 1.0, and shall be suitable for operation on 460 V, 3 phase, 60 hertz current. Verify Voltage at site
    - b. Optional Items:
      - 1) Weather hood Assembly

## 2.04 ELECTRICAL CONTROLS

- A. Control Panel: Each door shall be furnished with a NEMA 4 control panel enclosure, housing a reversing across-the-line type magnetic motor starter having thermal-overload protection along with relays, fuses, terminal strips, and other electronic components as required to provide the specified operating sequences. All components shall be prewired to the terminal strips, and neatly labeled. Power circuits in excess of 200 volts shall be provided with control transformers to reduce voltage in the control circuit to either 24 volts or 120 volts. Control panel assembly shall be U.L. labeled.
- B. Pushbuttons: Pushbuttons shall be located on the interior of the building where shown and shall be the three-button type, with the buttons marked "OPEN", "CLOSE", and "STOP". The "OPEN" button shall be of the type requiring only momentary pressure by the operator to cause the door to go from the closed to the fully open position. The "CLOSE" button shall require constant pressure from the operator to maintain the closing motion of the door. When the door is in motion and the "STOP" button is pressed, the door shall stop instantly and remain in the stop position; from the stop position, the door may then be operated in either direction by pushing the "OPEN", or "CLOSE" button. Pushbuttons shall be NEMA 4 rated.
  - 1. Limit Switches: Shall be NEMA rated switches mounted on the operator.
- C. Photo Eyes: A fail-safe photo electric eye shall be located on both sides of the opening. These photo eyes will automatically reverse the door if an obstruction is in the door opening during closing. Photo eyes shall be through beam type. Photo eye enclosures to be NEMA 4X or IP6.
- D. Reversing Device: Pneumatic-type reversing edges shall be located full length of the door on the leading edges of the two center sections. Reversing edges will automatically reverse the doors should they come in contact with an obstruction during closing. The reversing edges shall not substitute for limit switches.
- E. Optional Items: Consult factory for details
  - 1. Programmable logic controller (PLC)
  - 2. Radio controls with transmitters
  - 3. Internet connectivity: 50 channel FHSS myQ technology.
  - 4. Remote controls: One button DIP.
  - 5. Electrical disconnect switch – non-fused, fused, or circuit breaker types available
  - 6. Door position indicators
  - 7. Special Operation:
    - a. Fob shall allow operation of minimum 4 different doors. See Drawings. Provide one (1) fob per door, four (4) plus an additional twelve (12) fobs.

## 2.05 SHOP FINISHING

- A. General: Thoroughly clean, pre-treat and prime surfaces of door assembly including fixed panels, trim, support, and closure pieces.
  - 1. Pre-treatment: As required by primer manufacturer.
  - 2. Primer must be compatible with field finish coating as specified in Division 9.

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Verify that conditions are satisfactory for installation of electric four fold doors.
- B. Do not proceed with the Work of this Section until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. The installation of doors shall be by a Door Company that is factory trained and certified by the door manufacturer or supervised by an authorized representative of the door manufacturer.
- B. Install door and operating equipment complete with necessary hardware, jamb and head weather strips, anchors, inserts, hangers, and equipment supports in accordance with final Shop Drawings, manufacturer's instructions, and as specified herein.

- C. Upon completion of installation including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

**END OF SECTION**

**SECTION 08 3600  
INSULATED SECTIONAL OVERHEAD DOORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Insulated Glazed Aluminum Sectional Overhead Doors.
- B. Operating Hardware, tracks, and support.

**1.02 RELATED SECTIONS**

- A. Section 04 2000 - Unit Masonry: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.
- B. Section 05 5000 - Metal Fabrications: Steel frame and supports.
- C. Section 06 1000 – Rough Carpentry: Rough wood framing and blocking for door opening.
- D. Section 07 9200 - Joint Sealants: Perimeter sealant and backup materials.
- E. Section 08 3301 – Insulated Rolling Service Doors
- F. Section 08 3500 – Electric Four Fold Electric Doors
- G. Section 08 7123 – Commercial Door Operators
- H. Section 08 7100 - Door Hardware: Cylinder locks.
- I. Section 09 9000 - Paints and Coatings: Field painting.
- J. Division 26 – Electrical: - Raceway and Boxes: Empty conduit from control station to door operator.
- K. Division 26 – Electrical: - Wiring Connections: Electrical service to door operator.

**1.03 DESIGN / PERFORMANCE REQUIREMENTS**

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
  - 1. Design per ASCE 7-16.
- B. Wiring Connections: See Division 16 -Electrical for electrical characteristics requirements.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

**1.04 SUBMITTALS**

- A. Substitutions: See Section 01 3000 – Product 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. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Operation and Maintenance Data.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

#### **1.07 PROJECT CONDITIONS**

- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

#### **1.08 REFERENCE STANDARDS**

- A. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.
- B. DASMA 102 - American National Standard Specifications for Sectional Doors; 2018.

### **PART 2 PRODUCTS**

#### **2.01 BASIS OF DESIGN MANUFACTURERS**

- A. (972) 906-1499. Web Site: [www.overheaddoor.com](http://www.overheaddoor.com). E-mail: [sales@overheaddoor.com](mailto:sales@overheaddoor.com).
  - 1. Other Acceptable Manufacturers:
  - 2. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- B. Substitutions: See Section 01 6000 – Product Requirements.

#### **2.02 BASIS OF DESIGN GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS**

- A. Basis of Design Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
  - 1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
    - a. Panel Thickness: 1-3/4 inches (44 mm).
    - b. Center Stile Width: 2-11/16 inches (68 mm)
    - c. End Stile Width: 3-5/16 inches (84 mm) - 2 Per End
    - d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
    - e. Top Rail Width:
      - 1) 3-3/4 inches (95 mm).
    - f. Bottom Rail Width:
      - 1) 4-1/2 inches (114 mm).
    - g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
    - h. Stiles and Rails: 6063 - T6 aluminum.
    - i. Glazing:
      - 1) 1/4 inch (6 mm) Tempered glass.
  - 2. Finish and Color:
    - a. Power Coat Finish: Fire Engine Red to match Electric Four Fold Doors at front of building.
  - 3. Windload Design: Provide to meet the Design/Performance requirements specified.
  - 4. Hardware: Galvanized steel hinges and fixtures. Precision bearing rollers with hardened steel races.
  - 5. Lock:
    - a. Interior galvanized single unit with interlock.
  - 6. Weatherstripping:
    - a. Flexible bulb-type strip at bottom section.

- b. Flexible Jamb seals.
- c. Flexible Header seal.
- 7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. If 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.
- C. Coordinate with Section 08 7123- Commercial Door Operators.

#### **3.03 INSTALLATION**

- A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

#### **3.04 CLEANING AND ADJUSTING**

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

#### **3.05 PROTECTION**

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

**END OF SECTION**

**SECTION 08 4313  
ALUMINUM-FRAMED STOREFRONTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Door hardware.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Preparation of adjacent work to receive work of this section.
- B. Section 04 4313 - Stone Masonry Veneer: Preparation of adjacent work to receive work of this section.
- C. Section 07 2500 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.
- D. Section 07 8400 - Firestopping: Firestop at system junction with structure.
- E. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- F. Section 08 5113 - Aluminum Windows: Operable sash within glazing system.
- G. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- H. Section 08 8000 - Glazing: Glass and glazing accessories.

**1.03 REFERENCE STANDARDS**

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. 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.
- J. 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).
- K. 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).
- L. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).



**1.04 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.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and 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.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Specimen warranty.

**1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

**1.08 FIELD CONDITIONS**

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

**1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against 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 BASIS OF DESIGN MANUFACTURERS**

- A. Aluminum-Framed Storefronts:
  - 1. Kawneer North America: [www.kawneer.com/#sle](http://www.kawneer.com/#sle).

**2.02 OTHER ACCEPTABLE MANUFACTURERS**

- A. Aluminum-Framed Storefronts:
  - 1. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- B. Substitutions: See Section 01 6000 - Product Requirements.

**2.03 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING**

- A. Center-Set Style, Thermally-Broken:
  - 1. Basis of Design: Kawneer Trifab VerGlaze 451UT; [www.kawneer-ecommerce.com](http://www.kawneer-ecommerce.com).
    - a. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer.
- C. Substitutions: See Section 01 6000 - Product Requirements.
  - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

#### **2.04 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING**

- A. Center-Set Style:
  - 1. Basis of Design: Kawneer Trifab VerGlaze; [www.kawneer-ecommerce.com](http://www.kawneer-ecommerce.com).
    - a. Vertical Mullion Dimensions: 1-3/4 inches wide by 4 inches deep.
- B. Substitutions: See Section 01 6000 - Product Requirements.
  - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

#### **2.05 BASIS OF DESIGN -- SWINGING DOORS**

- A. Medium Stile, Monolithic Glazing:
  - 1. Basis of Design: Kawneer 350; [www.kawneer-ecommerce.com](http://www.kawneer-ecommerce.com).
  - 2. Thickness: 1-3/4 inches.
- B. Other Manufacturers: Not permitted; provide the product identified as "Basis of Design".
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer.
- D. Substitutions: See Section 01 6000 - Product Requirements.
  - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

#### **2.06 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: For 1 inch insulating glazing.
  - 2. Glazing Position: Centered (front to back).
  - 3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
  - 4. Finish: Class I natural anodized.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
  - 5. 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.
  - 6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
  - 7. 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.
  - 8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
  - 9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.

10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Performance Requirements
  1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
    - a. Design Wind Loads: Comply with requirements of ASCE 7.
    - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
  2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
  3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

## 2.07 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
  1. Framing members for interior applications need not be thermally broken.
  2. Glazing Stops: Flush.
- B. Glazing: See Section 08 8000.
- C. Swing Doors: Glazed aluminum.
  1. Thickness: 1-3/4 inches.
  2. Top Rail: 4 inches wide.
  3. Vertical Stiles: 4-1/2 inches wide.
  4. Bottom Rail: 10 inches wide.
  5. Glazing Stops: Square.
  6. Finish: Same as storefront.
- D. Interior Sliding Storefront Doors: Full glazed extruded aluminum frame and operable panels; manual operation; bottom rollers; flat or recessed sill.
  1. Configuration and Size: As indicated on drawings.
  2. Glazing Thickness: 1/4 inch.
  3. Stile Width: 2 inches.
  4. Frame Face Width: 1-1/2 inches.
  5. Provide deadlock keyed both sides on each operable panel.

## 2.08 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

## 2.09 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

## 2.10 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.
- E. Pivots: Center type; top and bottom.

1. Provide on all doors.
- F. Exit Devices: Panic type.
- G. Door Closers: Exposed overhead.
  1. Provide on doors as indicated.
- H. Locks: Dead latch with thumbturn inside ; keyed cylinder outside.
  1. Provide on doors as indicated.

### **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 wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- 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 hardware using templates provided.
- K. Install glass using glazing method required to achieve performance criteria; see Section 08 8000.
- L. 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 non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
  1. Perform a minimum of two tests in each designated area as indicated on drawings.
  2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- C. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
  1. Perform a minimum of two tests in each designated area as indicated on drawings.

2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
  - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
- D. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

### **3.05 ADJUSTING**

- A. Adjust operating hardware for smooth operation.

### **3.06 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.

### **3.07 PROTECTION**

- A. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION**

**SECTION 08 5213  
ALUMINUM CLAD DOUBLE HUNG WOOD WINDOWS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum Clad Double Hung wood windows complete with hardware, glazing, weather strip, simulated divided lite, jamb extension, and standard anchors, trim, attachments, factory-applied casing(s) and accessories

**1.02 RELATED SECTIONS**

- A. Section 01 3000 – Administrative Requirements for submittal procedures.
- B. Section 01 6000 – Product Requirements
- C. Section 01 7000 – Execution and Closeout Requirements
- D. Section 06 22 00 – Millwork: Wood trim other than furnished by window manufacturer
- E. Section 07 9200 – Joint Sealants: Sill sealant and perimeter caulking
- F. Section 09 9000 – Painting and Coating: Paint and stain other than factory-applied finish

**1.03 REFERENCE STANDARDS**

- A. AAMA 450 - Performance Rating Method for Muller Combination Assemblies, Composite Units, and Other Muller Fenestration Systems; 2020.
- B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- F. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

**1.04 REFERENCES**

- A. American Society for Testing Materials (ASTM):
  - 1. E283: Standard Test method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors
  - 2. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference
- B. E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential
  - 1. E2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights
  - 2. E2190: Specification for Sealed Insulated Glass Units
  - 3. C1036: Standard Specification for Flat Glass
  - 4. E2068: Standard Test Method for Determination of Operating Force of Sliding Windows and Doors
  - 5. E 1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes
  - 6. E 1886: Standard Test method for Performance of Exterior Windows, curtain Walls, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

7. F 2090-17: Standard Specifications for Windows Fall Prevention Devices with Emergency Escape (egress) Release Mechanisms
- C. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association (AAMA/WDMA/CSA):
  1. AAMA/WDMA/CSA 101/I.S.2/A440-08, Standard/Specification for windows, doors and skylights
  2. AAMA/WDMA/CSA 101/I.S.2/A440-11, Standard/Specification for windows, doors and skylights
  3. AAMA 450-10, Voluntary Performance Rating Method for Muller Fenestration Assemblies
  4. WDMA I.S.4: Industry Standard for Water Repellant Preservative Treatment for Millwork
  5. Window and Door Manufacturer's Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program
- D. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification Council (SIGMA/IGCC)
- E. American Architectural Manufacturer's Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels
- F. National Fenestration Rating Council (NFRC):
  1. 101: Procedure for Determining Fenestration Product thermal Properties
  2. 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence
- G. Window Covering Manufacturer's Association
  1. A100.1: American National Standard for Safety of Corded Window Coverings Products

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 – Administrative Requirements for submittal procedures.
- B. Shop Drawings: Submit shop drawings under provision of Section 01 3000.
- C. Product Data: Submit production data for certified options under provision of Section 01 300. Product performance rating information may be provided via quote, performance rating summary (NFRC Data), or certified performance grade summary (WDMA Hallmark data).
- D. Specified performance and design requirements.

#### **1.06 SAMPLES:**

- A. Submit corner section.

#### **1.07 QUALITY ASSURANCE**

- A. Meet local code and International Building Code requirements for:
  1. Egress, emergency escape and rescue requirements.

#### **1.08 DELIVERY**

- A. See Section 01 6000 – Product Requirements.
- B. Deliver in original packaging and protect from weather

#### **1.09 STORAGE AND HANDLING**

- A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation
- B. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 6000 – Product Requirements.

#### **1.10 WARRANTY**

- A. Clear insulating glass with stainless steel spacers shall be warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of Substantial Completion. Glass shall be warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of Substantial Completion.

- B. Standard exterior aluminum cladding finish shall be warranted against manufacturing defects resulting in chalk, fade and loss of adhesion (peel) per the American Architectural Manufacturer's Association (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of Substantial Completion.
- C. Hardware and other non-glass components shall be warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

## **PART 2 PRODUCTS**

### **2.01 BASIS OF DESIGN MANUFACTURED UNITS**

- A. Description: Ultimate Double Hung G2 as manufactured by Marvin, Warroad, Minnesota.

### **2.02 OTHER ACCEPTABLE MANUFACTURERS:**

- A. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.

### **2.03 SUBSTITUTIONS: SEE SECTION 01 6000 – PRODUCT REQUIREMENTS.**

### **2.04 FRAME DESCRIPTION**

- A. Interior: Non Finger-Jointed Pine
- B. Kiln-dried to moisture content no greater than 12 percent at the time of fabrication
- C. Water repellent, preservative treated in accordance with ANSI/WDMA I.S.4.
- D. Frame exterior aluminum clad with 0.050 inch (1.3mm) thick extruded aluminum
- E. Frame thickness: 1 1/16 inch (17mm) head and jambs
- F. Frame depth: Frame depth had an overall 5 21/32 inch jamb (144mm jamb depth from the nailing fin plane to the interior face of the frame for new construction.
- G. Sill assembly including the sill liner: 2 7/32 inch (56mm)

### **2.05 SASH DESCRIPTION**

- A. Interior: Non Finger-Jointed Pine.
- B. Kiln-dried to moisture content no greater than 12 percent at the time of fabrication.
- C. Water repellent preservative treated with accordance with WDMA I.S.4.
- D. Sash exterior aluminum clad with 0.050 inch (1.3mm) thick extruded aluminum.
- E. Sash thickness: 1 3/4 inch (44mm). Corner slot and tenoned.
- F. Operable sash tilt to interior for cleaning or removal.
- G. Equal Sash.
- H. Exterior Cope Profile: Putty.
- I. Interior Sash Sticking.
  - 1. Standard: Ogee.

### **2.06 GLAZING**

- A. Select quality complying with ASTM C1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E2190.
- B. Glazing method: Insulating glass
- C. Glazing seal: Silicone bedding on interior and exterior
- D. Glass fill: Air with capillary tubes, Argon
- E. Glass Type: Clear, Low E2 without Argon,

### **2.07 CERTIFIED MULLING**

- A. Directional mull limits: 1 High (can be 2 or more units wide in an assembly)
- B. Max mullion span is 71 1/2 inch (1816mm); max tributary width 45 1/4 inch (1149mm)



- C. CUDH NG 2.0 to CUDH NG 2.0 only
- D. Certified to Design Pressure 50

## **2.08 FINISH**

- A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat over a primer. Meets AAMA 2605 requirements.
- B. Aluminum clad color: Bright Silver Pearlescent.

## **2.09 INTERIOR FINISH:**

- A. Prime: Factory-applied water-borne acrylic primer. Meets WDMA TM-11 requirements.

## **2.10 HARDWARE**

- A. Locking system that provides locking, unlocking, balancing, and tilting of the sash members
- B. Lock Actuator Assembly
  - 1. Material: Zinc die-cast finishes: Satin Chrome
- C. Design Feature and Components
  - 1. Lock automatically locks when both sash are closed.

## **2.11 BALANCE SYSTEM (BALANCE SYSTEM DETERMINED BY SASH WEIGHT)**

- A. Hybrid spiral balances
  - 1. Material
  - 2. WOCD device: zinc die-cast

## **2.12 WEATHERSTRIP**

- A. Operating Units:
  - 1. Jambs: Foam-filled bulb
  - 2. Header: Continuous dual leaf
  - 3. Bottom rail and check rail: Hollow bulb

## **2.13 JAMB EXTENSION**

- A. Jamb extensions are available for various wall thickness factory-applied up to a 14 inch (356mm) wide.
- B. Finish: Match interior frame finish

## **2.14 SIMULATED DIVIDED LITES (SDL)**

- A. 1 1/8 inch (29mm) wide, with internal spacer bar
- B. Finish - Exterior matches exterior aluminum clad colors, Interior matches interior wood species and color.

## **2.15 ACCESSORIES AND TRIM**

- A. Installation Accessories:
- B. Factory-installed vinyl nailing/drip cap

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

### **3.02 INSTALLATION**

- A. Comply with Section 01 7000.
- B. Assemble and install window unit(s) according to manufacturer's instruction and reviewed shop drawing.

- C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 9200 Joint Sealants.
- D. Install accessory items as required.
- E. Use finish nails to apply wood trim and mouldings.

**3.03 FIELD QUALITY CONTROL**

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.

**3.04 CLEANING**

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.
- B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 7000.

**3.05 PROTECTING INSTALLED CONSTRUCTION**

- A. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

**END OF SECTION**

**SECTION 08 7100  
DOOR HARDWARE****PART 1 GENERAL****1.01 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.02 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. HINGES AND PIVOTS
  2. MORTISE LOCKSETS AND MORTISE DEADBOLTS
  3. EXIT DEVICES
  4. DOOR CLOSERS
  5. ANSI A156.8 OVERHEAD STOPS
  6. ANSI A156.21 & 22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, GASETING, WEATHERSTRIP
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 08 1113 - Hollow Metal Doors and Frames for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
  2. Section 08 5213 - Aluminum-Framed Entrances and Storefronts for entrance door hardware, except cylinders.

**1.03 REFERENCE STANDARDS**

1. BHMA A156.1 - Standard for Butts and Hinges; 2021.
2. BHMA A156.3 - Exit Devices; 2020.
3. BHMA A156.4 - Door Controls - Closers; 2019.
4. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.
5. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.
6. BHMA A156.18 - Materials and Finishes; 2020.
7. BHMA A156.21 - Thresholds; 2019.
8. BHMA A156.22 - Standard for Gasketing; 2021.
9. BHMA A156.25 - Electrified Locking Devices; 2018.
10. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
11. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
12. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
13. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
15. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
16. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.
17. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.
18. UL 1034 - Standard for Safety Burglary-Resistant Electrical Locking Mechanisms; Current Edition, Including All Revisions.

**1.04 COMPLY WITH THE FOLLOWING REFERENCE STANDARDS AND PUBLICATIONS AS APPLICABLE TO THE PROJECT.**

- A. International Building Code (IBC).
  - 1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities
  - 2. American with Disabilities Act Accessibility Guidelines
- B. National Fire Protection Association (NFPA):
  - 1. NFPA 70 Electrical Code
  - 2. NFPA 80 Fire Doors and Fire Windows.
  - 3. NFPA 101 Life Safety Code
  - 4. NFPA 105 Standard for the Installation of Smoke Door Assemblies
  - 5. NFPA 252 Fire Tests of Door Assemblies.
- C. Underwriters Laboratories Inc. (UL):
  - 1. UL 10C Positive Pressure Fire Tests Of Door Assemblies.
  - 2. UL 305 Panic Hardware.
  - 3. UL 437 Drill and Pick Resistant Key Cylinders.
  - 4. UL 1034 Burglary-Resistant Electric Locking Mechanisms.

**1.05 SUBMITTALS**

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of AHC or equal, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in Industry standards.
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared by or under the supervision of supplier, detailing the Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
  - 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.
- G. Warranties: Special warranties specified in this Section.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of five years experience who has completed door hardware 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. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs an AHC or qualified product consultant available during the course of the Work to consult with Contractor, Designer, and the Owner about door hardware and keying.
  1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Specifier & Product Consultants Qualifications: A person who is currently certified by DHI as an AHC or equal who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
  1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
  1. Provide 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.
- E. Regulatory Requirements: Comply with provisions of the following:
  1. Where indicated to comply with accessibility requirements, the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
    - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2 as required to meet ADA and ANSI 117.1.
  2. NFPA 101: Comply with the following for means of egress doors:
    - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
    - c. Thresholds: Not more than 1/2 inch high.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  1. Test Pressure: Test at atmospheric pressure.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  2. Preliminary key system schematic diagram.
  3. Requirements for key control system.
  4. Address for delivery of keys.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
  2. Review sequence of operation for each type of electrified door hardware.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review required testing, inspecting, and certifying procedures.
- I. Delivery: Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- J. Keys: Deliver keys to owner with signed receipt included in close-out documents.

#### **1.07 COORDINATION**

- A. Templates: Obtain and distribute to the parties' involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control and building control system.
- C. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- D. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of operators and door hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- E. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated. Include five year warranty for exit devices.
- F. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

#### **1.08 MAINTENANCE SERVICE**

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### **PART 2 PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS SHALL BE MEMBERS OF SPECIFIERS & PRODUCT CONSULTANTS- ALLIANCE OF INDEPENDENT OPENINGS AND INTERIOR MANUFACTURERS.**

- A. Substitutions shall be per Division 1 no later than 10 days before bid date.

**2.02 BASIS-OF-DESIGN MANUFACTURER: TOWNSTEEL MFG.**

**2.03 LISTING OF ACCEPTABLE MANUFACTURERS:**

1. Architectural Builders Hardware Mfg.
2. Don-Jo Mfg.
3. Legacy
4. PBB Inc
5. Select Products Limited
6. TownSteel Mfg.

**2.04 HINGES AND PIVOTS**

A. ANSI A156.1 Hinges mortise Type

1. ANSI A156.1, full mortise template type complying with following general requirements unless otherwise scheduled.
2. Widths: Sufficient to clear trim projection when door swings 180 degrees.
3. Number: Furnish minimum three hinges to 90 inches high, four hinges to 120 inches high for each door leaf
4. Doors Over 40 inches Wide: Extra heavy weight ball or oilite bearing hinges.
5. Doors 1-3/8-inch (1.38 inch) Thick: 3-1/2-inch (3.5 inch) size.
6. Doors 2 inch Thick: 5 inch extra heavy weight ball or oilite bearing.
7. Doors Over 48 inches Wide: 5 inch extra heavy weight ball
  - a. Pins: Furnish nonferrous hinges with non-removable pins (NRP) at exterior and locked out-swinging doors, non-rising pins at interior doors.
8. Tips: Furnish with matching plug.
9. Material: Steel – Satin and plated
10. Material: Stainless Steel – Satin finished.

Acceptable mfg.:	PBB	Ives	Hager
a. Bearing hvy wgt stainless steel	4B51	5BB1HW	BB1199
b. Ball bearing std wgt steel	BB81	5BB1	BB179

B. ANSI A15626 Continuous Hinges - Geared

1. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 1, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
2. Provide split polymer bearings at each hinge knuckle for quiet, smooth, self-lubricating operation. Provide hinge with no less than 32 bearings.
3. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.
4. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.
5. Install hinges with fasteners supplied by manufacturer.
6. Warranty: Hinges shall carry manufacturers lifetime warranty. Hinges must be stamped with manufacturers name for warranty purposes.

ABH	Select	PBB
A110HD	SL11HD	CG31

**2.05 MORTISE LOCKSETS AND MORTISE DEADBOLTS**

A. ANSI A156.1 Mortise Locks

1. Mortise locks shall be certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and shall be manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and

- field reversible for handing without opening the case.
- 2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
- 3. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
- 4. Lever design to be: Quest

Manufacturer	Series
TownSteel	MSS-R
Schlage	L9000
Sargent	8200

**B. Heavy-Duty Push-Button mortise lockset Electronic**

- 1. ADA compliant lock
- 2. Electronic mortise push-button lock
- 3. Material: Zinc
- 4. Finish: 626, Brass, Black
- 5. 80 codes combinations
- 6. Door Thickness 1 3/8" to 2 3/8".
- 7. Low battery warning
- 8. Backset: 2-3/4" included & 2-3/8" available
- 9. LED Indicator
- 10. Finish: 630m Brass, Black
- 11. Key pass
- 12. Remote release
- 13. User code digits 4. 5. 6
- 14. LED Indicator
- 15. 12 Buttons for combinations

**C. Mortise & Rim Cylinders**

- 1. Solid brass construction.
- 2. Prepped for Small Format Interchangeable Core (SFIC).
- 3. Provide screw fastened, interchangeable cams or tail piece, as required, to operate each keyed operating function.
- 4. Provide solid machined cylinder rings with tension spring to resist wrenching of cylinder. Length, finish and size as required.
- 5. Warranty: Three (3) years from date of installation.

**D. Cores and Keys - Small Format Interchangeable Cores**

- 1. Nickel-Silver Keys
- 2. Cores 6 pin solid brass construction
- 3. Individually capped
- 4. Stainless Steel C-clip assembled
- 5. Standard, Premium or Restricted keyways

**2.06 EXIT DEVICES**

**A. ANSI A156.3 Exit Devices - Heavy Duty**

- 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware.
- 2. Provide touchpad type exit devices, stainless steel. No aluminum rails are acceptable.
- 3. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall



match in material as well as finish.

4. Devices to incorporate a dead-latching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Vertical rod devices shall be capable of being field modified to less bottom rod devices by removal of bottom rod and adding firing pin(s), if required at fire rated openings.
6. Provide manufacturer's standard strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
9. Non-fire-rated exit devices shall have cylinder dogging
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
11. Lever style will match the lever style of the locksets.
12. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
13. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
14. Provide electrical options as scheduled.

TownSteel	Sargent	Inox		
ED9700	8800	ED93		

**2.07 DOOR CLOSERS**

- A. ANSI A156.4 Rack and Pinon heavy duty door closers.
  1. Exterior applications feature adjustable spring sizes from 1 to 6 and meets ANSI A117.1 and ADA for barrier-free accessibility.
  2. Compliant with UL10C for positive pressure.
  3. Certified to 1 million cycles by a recognized test lab. Non-handed.
  4. Featuring full range spring power adjustment and backcheck, with a narrow projection full cover and flat form style arm.
  5. Door control also features a backcheck positioning adjustment for parallel arm applications, to maintain an ANSI backcheck range similar to regular and top jamb applications.
  6. Independent sweep and latch non-critical closing speed adjustment.
  7. Standard Finish:

Townsteel	LCN	Inox
TDC40	4040XP	DC90

**2.08 ANSI A156.8 OVERHEAD STOPS**

- A. Surface mounted medium duty stops and holders.
  1. Provide medium duty concealed mounted overhead stop, holder or friction as specified for exterior and interior on moderate traffic and medium weight doors.
  2. Single or double acting doors. Non-handed.
  3. Stainless steel channel & arms.
  4. Standard installation from 85 to 110 degree of opening. 5-degree increments.
  5. Shock absorbing spring provides 3-to-5-degree cushion before dead stop.
  6. 1 3/4" minimum door thickness. UL Listed for use on wood doors rated up to 90 minutes and metal fire doors up to 3 hours, stop function only.

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- a. ANSI A156.21 & 22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, GASETING, WEATHERSTRIP

B. Door Sweeps Surface Mounted

1. Aluminum alloy 6063, T5 temper
2. Synthetic rubber polymer blend: Chloroprene and EPDM
3. Flame resistant & Moisture resistant
4. Temperature range -20°F to 200°F
5. BHMA certified to ANSI/BHMA A156.22 performance tests for heat and cold
6. #6 x 3/4" stainless steel sheet metal screws furnished
7. Screw holes slotted for adjustment
8. Nylon Brush is black
9. Silicone is gery
10. Neoprene is black
11. Anodized aluminum

Legacy	NGP	Pemko	
72918	C607	18041	

C. Aluminum Thresholds - Flat

1. Aluminum alloy 6063, T5 temper
2. Fluted top
3. BHMA certified to ANSI/BHMA A156.21 1,000 lb. load test
4. Typical wall thickness .125"
5. 3/16" x 1-3/4" FH HiLo-Tapping Thread, Grey Phillips Drive, Concrete Screws, Salt Spray: ASTM B117 Approved
6. #10 x 1-1/2" FH zinc plated wood screws included

Legacy	NGP	Pemko
3545/3476	513	271

D. Silicone with pressure sensitive Adhesive

1. Silicone
2. Self-Adhesive
3. Flame resistant & Moisture resistant
4. Temperature range -100°F to 500°F, remains flexible at extreme temperatures
5. Excellent resistance to ozone, UV and aging
6. Recommended for areas using FM200 or Halon Fire Suppression Systems
7. BHMA Certified to ANSI/BHMA A156.22 performance tests for heat, cold and air infiltration
8. Modified acrylic pressure sensitive adhesive protected by release liner
9. Provides high initial adhesion and long-term holding power for permanent mounting in exterior or interior locations
10. End use temperature range of adhesive, long term exposure -30°F up to 250°F
11. Edge Sealing System - category "G" for 20-minute rated category B wood doors perimeter application up to: single swing 4'0 x 8'0, pairs 8'0 x 8'0. Use 9550 at the meeting edge of pairs
12. Smoke and draft control - category "H", up to 3 hours hollow metal fire doors, up to 90 minutes wood fire doors
13. 1/2" wide x 1/4" tall

Legacy	NGP	Pemko
5881S	5050	S88

E. Overlapping astragals

1. Aluminum alloy 6063, T5 temper

2. Synthetic rubber polymer: Siloxane closed cell sponge
3. Premium grade seals specially formulated to withstand greater temperature extremes while providing maximum protection against air infiltration
4. Excellent flexibility and memory
5. Flame resistant & Moisture resistant
6. Temperature range -100°F to 500°F, remains flexible at extreme temperatures
7. Recommended for areas using FM200 or Halon Fire Suppression Systems
8. BHMA Certified to ANSI/BHMA A156.22 performance tests for heat and cold
9. Fire-rated Astragal Seals cannot replace any astragal required on the door by the door manufacturer to maintain its fire label
10. IBC, NFPA 80, NFPA105, and NFPA 252 require the gap at the meeting edge between fire labeled doors must not exceed 1/8"
11. #6 x 3/4" stainless steel sheet metal screws furnished
12. Screw holes slotted for adjustment
13. Silicone plus is tan
14. Anodized aluminum

Legacy	NGP	Pemko
774	183SP	357

**PART 3 PRODUCTS MANUFACTURE**

**3.01 FINISHES**

- A. Finish of all hardware shall be BHMA where specifically noted. Surface door closers must have metal covers, plastic is not acceptable.

**3.02 KEYING**

- A. Provide cylinders keyed into a New system- 6 or 7-pin SFIC keying system conforming to the following requirements:
- B. Provide removable core cylinders at all exterior openings. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
- C. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
- D. Provide patented keys, with a minimum of 5-year warranty against breakage, able to operate the manufacturer's patented restricted cylinders and high security restricted patented cylinders within the same master key system as follows
- E. Three keys per core and/or cylinder.
- F. Two construction core control keys
- G. Two permanent core control keys
- H. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
- I. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.

**3.03 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.04 PREPARATION**

- A. Steel Doors and Frames: Comply with A115 series.
- B. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- C. INSTALLATION
- D. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
- E. Standard Steel Doors and Frames: "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- F. Custom Steel Doors and Frames: Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- G. Installation: Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- H. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
- I. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- J. ADJUSTING
- K. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
- L. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- M. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
- N. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
- O. Consult with and instruct the Owner's personnel on recommended maintenance procedures.
- P. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

### **3.05 CLEANING AND PROTECTION**

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

**3.06 HARDWARE SET SCHEDULE**

**HARDWARE SET # 01**

**SGL ALD X ALF NON-RTD**

**DOOR #**

100

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
1		EA	HINGE, CONTINUOUS	SL11HD X DR HT	CL	SEL
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG

**BALANCE OF HARDWARE BY DOOR MANUFACTURER**

**HARDWARE SET # 02**

**SGL HMD X HMF NON-RTD**

**DOOR #**

114C

137

138I

138J

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG

NOTE: MOUNT CLOSER AND EXIT DEVICE STRIKE ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.

**HARDWARE SET # 02A**

**SGL HMD X HMF NON-RTD****DOOR #**

101A

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 02B****SGL HMD X HMF FIRE RATED****DOOR #**

107B

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 03**

**SGL HMD X HMF NON-RTD**

**DOOR #**

135

144

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	RAIN DRIP	5241 X LENGTH	CA	LEG
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	THRESHOLD	3445 X DR WIDTH	MA	LEG

NOTE: MOUNT CLOSER ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.

**HARDWARE SET # 04**

**PR HMD X HMF NON-RTD**

**DOOR #**

145

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
8		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
2		EA	MANUAL FLUSH BOLT	1555	626	DON
1		EA	DUST PROOF STRIKE	1570	626	DON
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	ASTRAGAL	774 X DR HT	CA	LEG
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	RAIN DRIP	5241 X LENGTH	CA	LEG

2	EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1	EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG

**NOTE: MOUNT CLOSER ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.**

**HARDWARE SET # 05**

SGL HMD X HMF NON-RTD

DOOR #

124

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PASSAGE MORTISE LOCKSET	MSS-R-01-Q	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 06**

SGL HMD X HMF NON-RTD

DOOR #

117

118

119

120

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH

**HARDWARE SET # 06A**

SGL HMD X HMF FIRE RATED

DOOR #

110

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW



1		SET	GASKETING	5881S X DR SIZE	BK	LEG
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**HARDWARE SET # 07**

**SGL HMD X HMF NON-RTD**

**DOOR #**

114A                      114B

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PASSAGE MORTISE LOCKSET	MSS-R-01-Q	626	TOW
1		EA	STOP ARM DR CLOSER	TDC40 HCUSH	689	TOW

**HARDWARE SET # 08**

**SGL HMD X HMF NON-RTD**

**DOOR #**

105                      108                      109                      112                      113                      126  
142

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PRIVACY MORTISE LOCK	MSS-R-02-Q	626	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 09**

**SGL HMD X HMF NON-RTD**

**DOOR #**

104                      127                      128                      129                      130                      131  
132                      133                      134

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	ENTRY LOCKSET	MSS-R-04-Q- SFIC6	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 10****SGL HMD X HMF FIRE RATED****DOOR #**

101B                      106                      107A                      136

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 11****SGL HMD X HMF NON-RTD****DOOR #**

122                      123

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 11A****SGL HMD X HMF NON-RTD****DOOR #**

111                      121                      125

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH

**HARDWARE SET # 11B**

**SGL HMD X HMF FIRE RATED****DOOR #**

103

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PUSH BUTTON EXIT MORTISE LOCK	ECR1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 12****SGL HMD X HMF FIRE RATED****DOOR #**

139

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 13****PR HMD X HMF NON-RTD****DOOR #**

143A

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
8		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
2		EA	MANUAL FLUSH BOLT	1555	626	DON
1		EA	DUST PROOF STRIKE	1570	626	DON

1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q- SFIC6	626	TOW
1		EA	ASTRAGAL	774 X DR HT	CA	LEG
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 14**

**SGL HMD X HMF FIRE RATED**

**DOOR #**

140

141

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q- SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**END OF SECTION**

**SECTION 08 7100  
DOOR HARDWARE****PART 1 GENERAL****1.01 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.02 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. HINGES AND PIVOTS
  2. MORTISE LOCKSETS AND MORTISE DEADBOLTS
  3. EXIT DEVICES
  4. DOOR CLOSERS
  5. ANSI A156.8 OVERHEAD STOPS
  6. ANSI A156.21 & 22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, GASKETING, WEATHERSTRIP
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 08 1113 - Hollow Metal Doors and Frames for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
  2. Section 08 5213 - Aluminum-Framed Entrances and Storefronts for entrance door hardware, except cylinders.

**1.03 REFERENCE STANDARDS**

1. BHMA A156.1 - Standard for Butts and Hinges; 2021.
2. BHMA A156.3 - Exit Devices; 2020.
3. BHMA A156.4 - Door Controls - Closers; 2019.
4. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.
5. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.
6. BHMA A156.18 - Materials and Finishes; 2020.
7. BHMA A156.21 - Thresholds; 2019.
8. BHMA A156.22 - Standard for Gasketing; 2021.
9. BHMA A156.25 - Electrified Locking Devices; 2018.
10. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
11. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
12. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
13. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
15. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
16. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.
17. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.
18. UL 1034 - Standard for Safety Burglary-Resistant Electrical Locking Mechanisms; Current Edition, Including All Revisions.

**1.04 COMPLY WITH THE FOLLOWING REFERENCE STANDARDS AND PUBLICATIONS AS APPLICABLE TO THE PROJECT.**

- A. International Building Code (IBC).
  - 1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities
  - 2. American with Disabilities Act Accessibility Guidelines
- B. National Fire Protection Association (NFPA):
  - 1. NFPA 70 Electrical Code
  - 2. NFPA 80 Fire Doors and Fire Windows.
  - 3. NFPA 101 Life Safety Code
  - 4. NFPA 105 Standard for the Installation of Smoke Door Assemblies
  - 5. NFPA 252 Fire Tests of Door Assemblies.
- C. Underwriters Laboratories Inc. (UL):
  - 1. UL 10C Positive Pressure Fire Tests Of Door Assemblies.
  - 2. UL 305 Panic Hardware.
  - 3. UL 437 Drill and Pick Resistant Key Cylinders.
  - 4. UL 1034 Burglary-Resistant Electric Locking Mechanisms.

**1.05 SUBMITTALS**

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of AHC or equal, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in Industry standards.
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared by or under the supervision of supplier, detailing the Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
  - 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.
- G. Warranties: Special warranties specified in this Section.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer with a minimum of five years experience who has completed door hardware 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. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs an AHC or qualified product consultant available during the course of the Work to consult with Contractor, Designer, and the Owner about door hardware and keying.
  1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Specifier & Product Consultants Qualifications: A person who is currently certified by DHI as an AHC or equal who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
  1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
  1. Provide 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.
- E. Regulatory Requirements: Comply with provisions of the following:
  1. Where indicated to comply with accessibility requirements, the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
    - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2 as required to meet ADA and ANSI 117.1.
  2. NFPA 101: Comply with the following for means of egress doors:
    - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
    - c. Thresholds: Not more than 1/2 inch high.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  1. Test Pressure: Test at atmospheric pressure.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  2. Preliminary key system schematic diagram.
  3. Requirements for key control system.
  4. Address for delivery of keys.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
  2. Review sequence of operation for each type of electrified door hardware.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review required testing, inspecting, and certifying procedures.
- I. Delivery: Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- J. Keys: Deliver keys to owner with signed receipt included in close-out documents.

#### **1.07 COORDINATION**

- A. Templates: Obtain and distribute to the parties' involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control and building control system.
- C. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- D. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of operators and door hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- E. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated. Include five year warranty for exit devices.
- F. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

#### **1.08 MAINTENANCE SERVICE**

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### **PART 2 PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS SHALL BE MEMBERS OF SPECIFIERS & PRODUCT CONSULTANTS- ALLIANCE OF INDEPENDENT OPENINGS AND INTERIOR MANUFACTURERS.**

- A. Substitutions shall be per Division 1 no later than 10 days before bid date.



**2.02 BASIS-OF-DESIGN MANUFACTURER: TOWNSTEEL MFG.**

**2.03 LISTING OF ACCEPTABLE MANUFACTURERS:**

1. Architectural Builders Hardware Mfg.
2. Don-Jo Mfg.
3. Legacy
4. PBB Inc
5. Select Products Limited
6. TownSteel Mfg.

**2.04 HINGES AND PIVOTS**

A. ANSI A156.1 Hinges mortise Type

1. ANSI A156.1, full mortise template type complying with following general requirements unless otherwise scheduled.
2. Widths: Sufficient to clear trim projection when door swings 180 degrees.
3. Number: Furnish minimum three hinges to 90 inches high, four hinges to 120 inches high for each door leaf
4. Doors Over 40 inches Wide: Extra heavy weight ball or oilite bearing hinges.
5. Doors 1-3/8-inch (1.38 inch) Thick: 3-1/2-inch (3.5 inch) size.
6. Doors 2 inch Thick: 5 inch extra heavy weight ball or oilite bearing.
7. Doors Over 48 inches Wide: 5 inch extra heavy weight ball
  - a. Pins: Furnish nonferrous hinges with non-removable pins (NRP) at exterior and locked out-swinging doors, non-rising pins at interior doors.
8. Tips: Furnish with matching plug.
9. Material: Steel – Satin and plated
10. Material: Stainless Steel – Satin finished.

Acceptable mfg.:	PBB	Ives	Hager
a. Bearing hvy wgt stainless steel	4B51	5BB1HW	BB1199
b. Ball bearing std wgt steel	BB81	5BB1	BB179

B. ANSI A15626 Continuous Hinges - Geared

1. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 1, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
2. Provide split polymer bearings at each hinge knuckle for quiet, smooth, self-lubricating operation. Provide hinge with no less than 32 bearings.
3. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.
4. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.
5. Install hinges with fasteners supplied by manufacturer.
6. Warranty: Hinges shall carry manufacturers lifetime warranty. Hinges must be stamped with manufacturers name for warranty purposes.

ABH	Select	PBB
A110HD	SL11HD	CG31

**2.05 MORTISE LOCKSETS AND MORTISE DEADBOLTS**

A. ANSI A156.1 Mortise Locks

1. Mortise locks shall be certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and shall be manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and

- field reversible for handing without opening the case.
- 2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
- 3. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
- 4. Lever design to be: Quest

Manufacturer	Series
TownSteel	MSS-R
Schlage	L9000
Sargent	8200

**B. Heavy-Duty Push-Button mortise lockset Electronic**

- 1. ADA compliant lock
- 2. Electronic mortise push-button lock
- 3. Material: Zinc
- 4. Finish:626, Brass, Black
- 5. 80 codes combinations
- 6. Door Thickness 1 3/8" to 2 3/8".
- 7. Low battery warning
- 8. Backset: 2-3/4" included & 2-3/8" available
- 9. LED Indicator
- 10. Finish: 630m Brass, Black
- 11. Key pass
- 12. Remote release
- 13. User code digits 4. 5. 6
- 14. LED Indicator
- 15. 12 Buttons for combinations

**C. Mortise & Rim Cylinders**

- 1. Solid brass construction.
- 2. Prepped for Small Format Interchangeable Core (SFIC).
- 3. Provide screw fastened, interchangeable cams or tail piece, as required, to operate each keyed operating function.
- 4. Provide solid machined cylinder rings with tension spring to resist wrenching of cylinder. Length, finish and size as required.
- 5. Warranty: Three (3) years from date of installation.

**D. Cores and Keys - Small Format Interchangeable Cores**

- 1. Nickel-Silver Keys
- 2. Cores 6 pin solid brass construction
- 3. Individually capped
- 4. Stainless Steel C-clip assembled
- 5. Standard, Premium or Restricted keyways

**2.06 EXIT DEVICES**

**A. ANSI A156.3 Exit Devices - Heavy Duty**

- 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware.
- 2. Provide touchpad type exit devices, stainless steel. No aluminum rails are acceptable.
- 3. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall

match in material as well as finish.

4. Devices to incorporate a dead-latching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Vertical rod devices shall be capable of being field modified to less bottom rod devices by removal of bottom rod and adding firing pin(s), if required at fire rated openings.
6. Provide manufacturer's standard strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
9. Non-fire-rated exit devices shall have cylinder dogging
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
11. Lever style will match the lever style of the locksets.
12. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
13. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
14. Provide electrical options as scheduled.

TownSteel	Sargent	Inox		
ED9700	8800	ED93		

**2.07 DOOR CLOSERS**

- A. ANSI A156.4 Rack and Pinon heavy duty door closers.
  1. Exterior applications feature adjustable spring sizes from 1 to 6 and meets ANSI A117.1 and ADA for barrier-free accessibility.
  2. Compliant with UL10C for positive pressure.
  3. Certified to 1 million cycles by a recognized test lab. Non-handed.
  4. Featuring full range spring power adjustment and backcheck, with a narrow projection full cover and flat form style arm.
  5. Door control also features a backcheck positioning adjustment for parallel arm applications, to maintain an ANSI backcheck range similar to regular and top jamb applications.
  6. Independent sweep and latch non-critical closing speed adjustment.
  7. Standard Finish:

Townsteel	LCN	Inox		
TDC40	4040XP	DC90		

**2.08 ANSI A156.8 OVERHEAD STOPS**

- A. Surface mounted medium duty stops and holders.
  1. Provide medium duty concealed mounted overhead stop, holder or friction as specified for exterior and interior on moderate traffic and medium weight doors.
  2. Single or double acting doors. Non-handed.
  3. Stainless steel channel & arms.
  4. Standard installation from 85 to 110 degree of opening. 5-degree increments.
  5. Shock absorbing spring provides 3-to-5-degree cushion before dead stop.
  6. 1 3/4" minimum door thickness. UL Listed for use on wood doors rated up to 90 minutes and metal fire doors up to 3 hours, stop function only.

ABH	Don-Jo	Rixson		

N3300A	3300	10
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- a. ANSI A156.21 & 22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, GASETING, WEATHERSTRIP

B. Door Sweeps Surface Mounted

1. Aluminum alloy 6063, T5 temper
2. Synthetic rubber polymer blend: Chloroprene and EPDM
3. Flame resistant & Moisture resistant
4. Temperature range -20°F to 200°F
5. BHMA certified to ANSI/BHMA A156.22 performance tests for heat and cold
6. #6 x 3/4" stainless steel sheet metal screws furnished
7. Screw holes slotted for adjustment
8. Nylon Brush is black
9. Silicone is gery
10. Neoprene is black
11. Anodized aluminum

Legacy	NGP	Pemko	
72918	C607	18041	

C. Aluminum Thresholds - Flat

1. Aluminum alloy 6063, T5 temper
2. Fluted top
3. BHMA certified to ANSI/BHMA A156.21 1,000 lb. load test
4. Typical wall thickness .125"
5. 3/16" x 1-3/4" FH HiLo-Tapping Thread, Grey Phillips Drive, Concrete Screws, Salt Spray: ASTM B117 Approved
6. #10 x 1-1/2" FH zinc plated wood screws included

Legacy	NGP	Pemko
3545/3476	513	271

D. Silicone with pressure sensitive Adhesive

1. Silicone
2. Self-Adhesive
3. Flame resistant & Moisture resistant
4. Temperature range -100°F to 500°F, remains flexible at extreme temperatures
5. Excellent resistance to ozone, UV and aging
6. Recommended for areas using FM200 or Halon Fire Suppression Systems
7. BHMA Certified to ANSI/BHMA A156.22 performance tests for heat, cold and air infiltration
8. Modified acrylic pressure sensitive adhesive protected by release liner
9. Provides high initial adhesion and long-term holding power for permanent mounting in exterior or interior locations
10. End use temperature range of adhesive, long term exposure -30°F up to 250°F
11. Edge Sealing System - category "G" for 20-minute rated category B wood doors perimeter application up to: single swing 4'0 x 8'0, pairs 8'0 x 8'0. Use 9550 at the meeting edge of pairs
12. Smoke and draft control - category "H", up to 3 hours hollow metal fire doors, up to 90 minutes wood fire doors
13. 1/2" wide x 1/4" tall

Legacy	NGP	Pemko
5881S	5050	S88

E. Overlapping astragals

1. Aluminum alloy 6063, T5 temper

2. Synthetic rubber polymer: Siloxane closed cell sponge
3. Premium grade seals specially formulated to withstand greater temperature extremes while providing maximum protection against air infiltration
4. Excellent flexibility and memory
5. Flame resistant & Moisture resistant
6. Temperature range -100°F to 500°F, remains flexible at extreme temperatures
7. Recommended for areas using FM200 or Halon Fire Suppression Systems
8. BHMA Certified to ANSI/BHMA A156.22 performance tests for heat and cold
9. Fire-rated Astragal Seals cannot replace any astragal required on the door by the door manufacturer to maintain its fire label
10. IBC, NFPA 80, NFPA105, and NFPA 252 require the gap at the meeting edge between fire labeled doors must not exceed 1/8"
11. #6 x 3/4" stainless steel sheet metal screws furnished
12. Screw holes slotted for adjustment
13. Silicone plus is tan
14. Anodized aluminum

Legacy	NGP	Pemko
774	183SP	357

**PART 3 PRODUCTS MANUFACTURE**

**3.01 FINISHES**

- A. Finish of all hardware shall be BHMA where specifically noted. Surface door closers must have metal covers, plastic is not acceptable.

**3.02 KEYING**

- A. Provide cylinders keyed into a New system- 6 or 7-pin SFIC keying system conforming to the following requirements:
- B. Provide removable core cylinders at all exterior openings. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
- C. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
- D. Provide patented keys, with a minimum of 5-year warranty against breakage, able to operate the manufacturer's patented restricted cylinders and high security restricted patented cylinders within the same master key system as follows
- E. Three keys per core and/or cylinder.
- F. Two construction core control keys
- G. Two permanent core control keys
- H. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
- I. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.

**3.03 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.04 PREPARATION**

- A. Steel Doors and Frames: Comply with A115 series.
- B. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- C. INSTALLATION
- D. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
- E. Standard Steel Doors and Frames: "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- F. Custom Steel Doors and Frames: Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- G. Installation: Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- H. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
- I. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- J. ADJUSTING
- K. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
- L. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- M. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
- N. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
- O. Consult with and instruct the Owner's personnel on recommended maintenance procedures.
- P. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

### **3.05 CLEANING AND PROTECTION**

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

**3.06 HARDWARE SET SCHEDULE**

**HARDWARE SET # 01**

**SGL ALD X ALF NON-RTD**

**DOOR #**

100

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
1		EA	HINGE, CONTINUOUS	SL11HD X DR HT	CL	SEL
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG

**BALANCE OF HARDWARE BY DOOR MANUFACTURER**

**HARDWARE SET # 02**

**SGL HMD X HMF NON-RTD**

**DOOR #**

114C

137

138I

138J

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG

NOTE: MOUNT CLOSER AND EXIT DEVICE STRIKE ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.

**HARDWARE SET # 02A**

**SGL HMD X HMF NON-RTD****DOOR #**

101A

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 02B****SGL HMD X HMF FIRE RATED****DOOR #**

107B

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	RIM EXIT DEVICE	ED9700	630	TOW
1		EA	PUSH BUTTON EXIT DEVICE TRIM	EKE1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG



**HARDWARE SET # 03****SGL HMD X HMF NON-RTD****DOOR #**

135

144

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	RAIN DRIP	5241 X LENGTH	CA	LEG
1		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG
1		EA	THRESHOLD	3445 X DR WIDTH	MA	LEG

NOTE: MOUNT CLOSER ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.

**HARDWARE SET # 04****PR HMD X HMF NON-RTD****DOOR #**

145

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
8		EA	EXTERIOR HVY WT HINGE	4B51 4.5 X 4.5 NRP	630	PBB
2		EA	MANUAL FLUSH BOLT	1555	626	DON
1		EA	DUST PROOF STRIKE	1570	626	DON
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	ASTRAGAL	774 X DR HT	CA	LEG
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH
1		SET	WEATHERSTRIPPING	5924 X DR SIZE	CA	LEG
1		EA	RAIN DRIP	5241 X LENGTH	CA	LEG
2		EA	EXTERIOR SWEEP	72918 X DR WIDTH	CA	LEG

1		EA	OFFSET THRESHOLD	3476 X 386 X DR WIDTH	MA	LEG
<b>NOTE: MOUNT CLOSER ON WEATHERSEAL. DO NOT NOTCH WEATHERSEAL.</b>						

**HARDWARE SET # 05**

SGL HMD X HMF NON-RTD

DOOR #

124

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PASSAGE MORTISE LOCKSET	MSS-R-01-Q	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 06**

SGL HMD X HMF NON-RTD

DOOR #

117

118

119

120

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q- SFIC6	626	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH

**HARDWARE SET # 06A**

SGL HMD X HMF FIRE RATED

DOOR #

110

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q- SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 07**

**SGL HMD X HMF NON-RTD**

**DOOR #**

114A                      114B

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PASSAGE MORTISE LOCKSET	MSS-R-01-Q	626	TOW
1		EA	STOP ARM DR CLOSER	TDC40 HCUSH	689	TOW

**HARDWARE SET # 08**

**SGL HMD X HMF NON-RTD**

**DOOR #**

105                      108                      109                      112                      113                      126  
142

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PRIVACY MORTISE LOCK	MSS-R-02-Q	626	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 09**

**SGL HMD X HMF NON-RTD**

**DOOR #**

104                      127                      128                      129                      130                      131  
132                      133                      134

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	ENTRY LOCKSET	MSS-R-04-Q-SFIC6	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 10**

**SGL HMD X HMF FIRE RATED****DOOR #**

101B                      106                      107A                      136

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 11****SGL HMD X HMF NON-RTD****DOOR #**

122                      123

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	WALL STOP	1407	630	DON

**HARDWARE SET # 11A****SGL HMD X HMF NON-RTD****DOOR #**

111                      121                      125

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q-SFIC6	626	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH

**HARDWARE SET # 11B****SGL HMD X HMF FIRE RATED**

**DOOR #**

103

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	PUSH BUTTON EXIT MORTISE LOCK	ECR1B2-R-Q-SFIC6	630	TOW
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 12**

SGL HMD X HMF FIRE RATED

**DOOR #**

139

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q-SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 13**

PR HMD X HMF NON-RTD

**DOOR #**

143A

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
8		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
2		EA	MANUAL FLUSH BOLT	1555	626	DON
1		EA	DUST PROOF STRIKE	1570	626	DON

1		EA	STOREROOM MORTISE LOCKSET	MSS-R-07-Q- SFIC6	626	TOW
1		EA	ASTRAGAL	774 X DR HT	CA	LEG
1		EA	DOOR CLOSER	TDC40 CUSH	689	TOW
1		EA	OVERHEAD STOP	3300A	630	ABH
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**HARDWARE SET # 14****SGL HMD X HMF FIRE RATED****DOOR #**

140

141

**EACH TO HAVE:**

QTY	ITEM	UNIT	DESCRIPTION	MODEL NUMBER	FINISH	MFG.
4		EA	STD WT HINGE	BB81 4.5" X 4.5"	652	PBB
1		EA	CLASSROOM MORTISE LOCKSET	MSS-R-05-Q- SFIC6	626	TOW
1		EA	DOOR CLOSER	TDC40	689	TOW
1		EA	WALL STOP	1407	630	DON
1		SET	GASKETING	5881S X DR SIZE	BK	LEG

**END OF SECTION**

**SECTION 08 7123  
COMMERCIAL DOOR OPERATORS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Gearhead Trolley– Logic 5.0 plus remote control equipment for Rolling Service Doors.

**1.02 RELATED SECTIONS**

- A. Section 06 1000 - Rough Carpentry: Installation and requirements for blocking and nailers.
- B. Section 08 1113 - Hollow Metal Doors and Frames.
- C. Section 08 3301 - Insulated Rolling Service Doors
- D. Section 08 3600 - Insulated Sectional Overhead Doors.
- E. Section 083500 - Electric Four Fold Doors.
- F. Section 08 4313 - Aluminum-Framed Storefronts.
- G. Section 16 050 - Basic Electrical Materials and Methods: Installation and requirements for electrical connections.

**1.03 REFERENCE STANDARDS**

- A. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures,
- B. Action Submittals:
  - 1. Product Data: Manufacturer's descriptive data and product attributes.
- C. Closeout Submittals:
  - 1. Operation and Maintenance Data.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Firm specializing in work of this Section, with minimum 2 years' experience.

**1.06 WARRANTY**

- A. Manufacturer's 2 year warranty against material and manufacturing defects.

**PART 2 PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Contract Documents are based on products by LiftMaster. [www.LiftMaster.com](http://www.LiftMaster.com).
- B. Other Acceptable Manufacturers:
  - 1. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- C. Substitutions: See Section 01 6000 – Product Requirements.

**2.02 BASIS OF DESIGN MANUFACTURED UNITS**

- A. Door Operators:
  - 1. Model: GT.
  - 2. Operation: Gearhead trolley.
  - 3. Drive type: Worm gear in sealed oil bath.
  - 4. Mounting: Ceiling.
  - 5. Disconnect for manual operation: Quick disconnect door arm.
  - 6. Rated duty cycle: Maximum 25 cycles per hour and 125 cycles per day.
  - 7. Meet UL 325.

8. Motor: Listed by Underwriters Laboratories, sized to door conditions.
9. Enclosure: NEMA 1.
10. Travel rate: 11 to 12 inches per second.
11. Radio receiver: Logic 5.0 on-board; accept Security+ rolling code technology remote controls and binary DIP switch remote controls.
12. Internet connectivity: 50 channel FHSS myQ technology.
13. Control station: Three push button type [Three position key operated type] in NEMA 1 enclosure.
14. Remote controls: One button DIP.
15. Primary monitored entrapment protection: Retro-reflective sensor system.
16. Secondary non-monitored entrapment protection: Sensing edge system.
17. Track: Dual L-rail trolley track.
18. Special Operation:
  - a. Fob shall allow operation of minimum 4 different doors. See Drawings. Provide one (1) fob per door, four (4) plus an additional twelve (12) fobs.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

#### **3.02 CLOSEOUT ACTIVITIES**

- A. Test and adjust operators for proper operation.
- B. Demonstration: Demonstrate operation and programming of operators to Owner.

**END OF SECTION**



**SECTION 08 9100  
LOUVERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Louvers, frames, and accessories.

**1.02 RELATED REQUIREMENTS****1.03 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
- C. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type 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 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
  - 1. Finish: Include twenty year coverage against degradation of exterior finish.

**PART 2 PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Louvers:
  - 1. Construction Specialties, Inc; Storm-Resistant Louver: [www.c-sgroup.com/#sle](http://www.c-sgroup.com/#sle).
  - 2. Other Acceptable Manufacturers: Manufacturers providing products which meet these specifications and approved by Architect prior to bidding.

**2.02 LOUVERS**

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
  - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
  - 2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

- B. Louvers, Type \_\_\_\_: Aluminum outer frames, louver end frames only, non-thermally broken, air ventilator with overlapping louvers.
1. Free Area: 7.24 sq. ft., minimum.
  2. Blades: Drainable.
  3. Frame: 6 inch deep, 4 inch wide, extruded aluminum.
  4. Aluminum Thickness: Frame \_\_\_\_ gauge, 0081 inch minimum; blades \_\_\_\_ gauge, 0.60 inch minimum.
  5. Aluminum Finish: Class I natural anodized; finish welded units after fabrication.
  6. Frame Mounted: To structural opening using through frame or strap fixings.
  7. Frame Size: As indicated on drawings.
  8. Note configurations required as indicated on drawings.

### **2.03 MATERIALS**

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Formed Aluminum: Formed sheet, ASTM B209/B209M.
- C. Stainless Steel: ASTM A666, Type 304, soft temper, smooth surface, No. 4 brushed finish.

### **2.04 FINISHES**

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick. Match other finishes on Building.

### **2.05 ACCESSORIES**

- A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- B. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.
- C. Insect Screen: 18 x 16 size aluminum mesh.
- D. Fasteners and Anchors: Stainless steel.
- E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

### **3.02 INSTALLATION**

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.

### **3.03 CLEANING**

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

**END OF SECTION**

**SECTION 09 2116  
GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- D. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- E. Section 09 9000 - Painting: Field painting of gypsum board.
- F. Division 22 - Plumbing: Prefabricated Shower Units.

**1.03 REFERENCE STANDARDS**

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
- E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- G. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.
- H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- I. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- J. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.
- K. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- L. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

- M. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- N. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- O. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- P. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
- Q. 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; 2022.
- R. 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.
- S. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- T. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022.
- U. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- V. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- W. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- X. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- Y. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.
- Z. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- AA. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).
- BB. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.
- CC. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.
- DD. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- EE. UL (FRD) - Fire Resistance Directory; Current Edition.
- FF. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- GG. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Sequencing: Install service utilities in an orderly and expeditious manner.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.

2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Shop Drawings: Indicate special details associated with prefabricated shower units.
- D. Steel Framing Industry Association (SFIA) Certification:
  1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.
  2. Submit current documentation of contractor and fabricator accreditation. Keep copies of each on-site during and after installation, and present upon request.
  3. Submit certification by the manufacturer that the products being submitted will perform as required based on the specific project conditions.
- E. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections. The contractor is responsible for confirming the studs supplied will meet the span requirements required by the project.
- F. SSMA Manufacturer Qualification: Submit documentation of manufacturer association membership.
- G. Installer's Qualification Statement.

### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): [www.ssma.com/#sle](http://www.ssma.com/#sle).
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.
- C. Documents at Project Site: Maintain at the project site a copy of manufacturer's instructions, erection drawings, shop drawings, and reference standard documents containing execution requirements.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.
- C. Store metal products to prevent corrosion.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  1. See PART 3 for finishing requirements.

### **2.02 METAL FRAMING MATERIALS**

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
  1. ClarkDietrich: [www.clarkdietrich.com](http://www.clarkdietrich.com)
  2. MarinoWARE: [www.marinoware.com](http://www.marinoware.com)
  3. SCAFECO Corporation: [www.scafco.com](http://www.scafco.com)
  4. Substitutions: See Section 01 6000 - Product Requirements.
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
  1. Studs: C-shaped with knurled or embossed faces.
  2. Runners: U shaped, sized to match studs.

3. Ceiling Channels: C-shaped.
  4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch or as indicated on the drawings..
- D. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

### 2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  2. Georgia-Pacific Gypsum: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  3. Gold Bond Building Products, LLC provided by National Gypsum Company; \_\_\_\_: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
  4. USG Corporation: [www.usg.com](http://www.usg.com).
  5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold resistant board is required at all locations.
  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.
    - b. Ceilings: 5/8 inch.
  5. Mold-Resistant, Paper-Faced Products:
    - a. Georgia-Pacific Gypsum; ToughRock Mold-Guard: [www.gpgypsum.com](http://www.gpgypsum.com).
    - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: [www.goldbondbuilding.com](http://www.goldbondbuilding.com).
    - c. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): [www.usg.com](http://www.usg.com).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including shower ceilings and shower surrounds.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
  2. Thickness: 5/8 inch.
  3. Edges: Tapered.
  4. Products:
    - a. CertainTeed Corporation; Interior Ceiling Drywall: [www.certainteed.com](http://www.certainteed.com).
    - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond High Strength LITE Gypsum Board: [www.goldbondbuilding.com](http://www.goldbondbuilding.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.

### 2.04 GYPSUM BOARD ACCESSORIES

- A. Beads, Joint Accessories, and Other Trim: ASTM C1047, rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
- B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.

2. Joint Compound: Drying type, vinyl-based, ready-mixed.
- C. 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.
- D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

#### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
  1. Partition framing shall comply with this spec and the manufacturer's published installation requirements including span tables. Provide bridging and bracing as required by the manufacturer for all non-composite partitions, and for any composite partitions that exceed the span limits of the manufacturer whether specifically indicated or not.
  2. Span limits shall be based on L/120 and 5 psf unless noted otherwise in the partition schedule/detail on the drawings.
- B. Ceilings and Soffits: Space framing and furring members as indicated.
  1. Level ceiling system to a tolerance of 1/1200.
- C. Studs: Space studs at 16 inches on center, this requirement take precedent over any conflicting notes that are found elsewhere in the documents.
  1. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
  1. Orientation: Vertical.
  2. Spacing: At 16 inches on center.

#### **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 perpendicular to framing, with ends and edges occurring over firm bearing.
  1. This results in a non-composite wall which must be braced at 4'-0" oc as required by the stud manufacturer.

#### **3.04 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Corner Beads: Install at external corners, using longest practical lengths.
- B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

#### **3.05 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- C. 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.
- D. 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 in any direction.

**3.07 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean \_\_\_\_\_.

**3.08 PROTECTION**

- A. Protect installed gypsum board assemblies from subsequent construction operations.

**END OF SECTION**



**SECTION 09 3000  
TILING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Tile for shower receptors.
- D. Non-ceramic trim.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry.
- B. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Division 22 - Plumbing: Shower receptor.

**1.03 REFERENCE STANDARDS**

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.
- B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.
- C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.
- D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.
- E. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.
- F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.
- G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
- H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.
- I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
- J. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.
- K. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
- L. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
- M. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

- N. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
- O. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2014 (Reaffirmed 2019).
- P. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).
- Q. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2019.
- R. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- S. 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.
- T. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2021.
- U. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.
- V. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- W. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2021.
- X. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.
- F. Installer's Qualification Statement:
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 10 square feet of each type.

#### **1.06 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.

### 1.07 MOCK-UPS

- A. See Section 01 4000 - Quality Requirements for general requirements for mock-up.
- B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
  1. Minimum size of mock-up is indicated on drawings.
  2. Approved mock-up may remain as part of work.

### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

### 1.09 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

## PART 2 PRODUCTS

### 2.01 TILE

- A. Basis of Design Manufacturers: All products by the same manufacturer.
  1. Dal-Tile Corporation: [www.daltile.com/#sle](http://www.daltile.com/#sle).
- B. Other Acceptable Manufacturers:
  1. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- C. Substitutions: See Section 01 6000 - Product Requirements.
- D. Glazed Wall Tile, Type WT-1: ANSI A137.1 standard grade.
  1. Moisture Absorption: <0.5 percent as tested in accordance with ASTM C373.
  2. Size: 12 by 24 inch, nominal.
  3. Surface Finish: Matte glaze.
  4. Color(s): As indicated on drawings.
  5. Products:
    - a. Dal-Tile Corporation; Slate Attache: [www.daltile.com/#sle](http://www.daltile.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Glazed Wall Tile, Type WT-2: ANSI A137.1 standard grade.
  1. Moisture Absorption: <20 percent as tested in accordance with ASTM C373.
  2. Size: 3 by 10 inch, nominal.
  3. Surface Finish: Matte glaze.
  4. Color(s): As indicated on drawings.
  5. Products:
    - a. Dal-Tile Corporation; Revalia Remix RV0528SAMMT: [www.daltile.com/#sle](http://www.daltile.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- F. Porcelain Tile, Type T-1: ANSI A137.1 standard grade.
  1. Moisture Absorption: <0.5 percent as tested in accordance with ASTM C373.
  2. Color(s): As indicated on drawings.
  3. Products:
    - a. Dal-Tile Corporation; Union Smoke Rectangle: [www.daltile.com/#sle](http://www.daltile.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: 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. Thresholds at door openings.
- c. Floor-to-wall joints.
2. Products:
  - a. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).
  - b. Substitutions: See Section 01 6000 - Product Requirements.

### 2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Basis of Design Manufacturers:
  1. LATICRETE International, Inc: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- C. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
  1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
  2. Products:
    - a. LATICRETE International, Inc; MULTIMAX LITE: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.
  1. Products:
    - a. ARDEX Engineered Cements; A 38: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
    - b. LATICRETE International, Inc; LATICRETE 3701 Fortified Mortar Bed: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - c. Merkrete, by Parex USA, Inc; Merkrete Underlay C: [www.merkrete.com/#sle](http://www.merkrete.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### 2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Basis of Design Manufacturers:
  1. LATICRETE International, Inc: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- C. Standard Grout: ANSI A118.6 standard cement grout.
  1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
  2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
  3. Color(s): As indicated on drawings.
  4. Products:

### 2.05 MAINTENANCE MATERIALS

- A. Grout Release: Temporary, water-soluble pre-grout coating.

### 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 gap, minimum.
  2. Fluid or Trowel Applied Type:
    - a. Thickness: 20 mils, maximum.
    - b. Products:
      - 1) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: [www.tecspecialty.com/#sle](http://www.tecspecialty.com/#sle).
      - 2) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).

- 3) Merkrete, by Parex USA, Inc; Merkrete Fracture Guard:  
www.merkrete.com/#sle.
  - 4) Substitutions: See Section 01 6000 - Product Requirements.
- B. Waterproofing Membrane at walls, floor, and miscellaneous: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
  2. Fluid or Trowel Applied Type:
    - a. Material: Synthetic rubber or Acrylic.
    - b. Thickness: 25 mils, minimum, dry film thickness.
    - c. Products:
      - 1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
      - 2) LATICRETE International, Inc; LATICRETE HYDRO BAN:  
www.laticrete.com/#sle.
      - 3) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 1:  
www.merkrete.com/#sle.
      - 4) Substitutions: See Section 01 6000 - Product Requirements.
- C. Waterproofing Membrane at Showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Fluid or Trowel Applied Type:
    - a. Material: Synthetic rubber.
    - b. Thickness: 25 mils, minimum, dry film thickness.
    - c. Products:
      - 1) LATICRETE International, Inc; LATICRETE HYDRO BAN:  
www.laticrete.com/#sle.
      - 2) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000:  
www.merkrete.com/#sle.
      - 3) Substitutions: See Section 01 6000 - Product Requirements.

### **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 tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
  1. Test as Follows:
    - a. Alkalinity (pH): ASTM F710.
    - b. Internal Relative Humidity: ASTM F2170.
    - c. Moisture Vapor Emission: ASTM F1869.
  2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

#### **3.02 PREPARATION**

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

**3.03 INSTALLATION - GENERAL**

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

**3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
  - 1. Use uncoupling membrane under all tile unless other underlayment is indicated.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

**3.05 INSTALLATION - FLOORS - MORTAR BED METHODS**

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
  - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.
- B. Cleavage Membrane: Lap edges and ends.
- C. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

**3.06 INSTALLATION - SHOWER WALLS**

- A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.
- B. Grout with standard grout as specified above.

**3.07 INSTALLATION - WALL TILE**

- A. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

**3.08 CLEANING**

- A. Clean tile and grout surfaces.

**3.09 PROTECTION**

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**END OF SECTION**

**SECTION 09 5100  
ACOUSTICAL CEILINGS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

**1.02 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- E. 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; 2022.
- F. 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 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

**1.05 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

**PART 2 PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Suspension Systems:
  - 1. Armstrong World Industries, Inc: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 OTHER ACCEPTABLE MANUFACTURERS**

- A. Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- B. Substitutions: See Section 01 6000 - Product Requirements.

### 2.03 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D and complying with the following:
  - 1. Local authorities having jurisdiction.

### 2.04 ACOUSTICAL UNITS

- A. Acoustical Panels, Type ACT-1: Mineral fiber with membrane-faced overlay, with the following characteristics:
  - 1. Classification: ASTM E1264 Type IV.
  - 2. Size: 24 by 24 inches.
  - 3. Thickness: 3/4 inch.
  - 4. Light Reflectance: 88% percent, determined in accordance with ASTM E1264.
  - 5. NRC Range: 0.75, determined in accordance with ASTM E1264.
  - 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 7. Panel Edge: Beveled Tegular.
  - 8. Color: White.
  - 9. Suspension System: Exposed grid.
  - 10. Products:
    - a. Armstrong World Industries, Inc; Ultima: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Acoustical Panels, Type ACT-2: Mineral fiber with scrubbable finish, with the following characteristics:
  - 1. Classification: ASTM E1264 Type IX.
    - a. Form: 2, water felted.
  - 2. Size: 24 by 24 inches.
  - 3. Thickness: 5/8 inch.
  - 4. Light Reflectance: 0.89 percent, determined in accordance with ASTM E1264.
  - 5. Ceiling Attenuation Class (CAC): 33, determined in accordance with ASTM E1264.
  - 6. Panel Edge: Square.
  - 7. Color: White.
  - 8. Suspension System: Exposed grid.
  - 9. Products:

### 2.05 SUSPENSION SYSTEM(S)

- 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.
  - 1. Materials:
    - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
  - 1. Application(s): Seismic.
  - 2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  - 3. Finish: Baked enamel.
  - 4. Color: White.
  - 5. Products:
    - a. Armstrong World Industries, Inc; Prelude XL: [www.armstrongceilings.com/#sle..](http://www.armstrongceilings.com/#sle..)

### 2.06 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 galvanized steel wire.



- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as 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.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

#### **3.03 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and 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 plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Use longest practical lengths.
- E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- 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 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 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 as directed by Architect.
- 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 of an exterior door.

**3.05 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**3.06 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

**END OF SECTION**

**SECTION 09 6500  
RESILIENT FLOORING**

**PART 1 - GENERAL****1.01 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.02 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Resilient tile flooring for commercial traffic.
  2. Substrate preparation.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 03 3000 - Cast-in-Place Concrete for concrete substrate; slab surface tolerances; vapor retarder for applications on grade.
  2. Section 06 1000 - Rough Carpentry.
- C. References (Industry Standards):
1. American Association of Textile Chemists and Colorists (AATCC):
    - a. AATCC 134 - Electrostatic Propensity of Carpets
  2. American National Standards Institute (ANSI):
    - a. ANSI ESD S97.2 - Floor Materials and Footwear – Voltage Measurement on a Person
  3. ASTM International (ASTM):
    - a. ASTM C518 - Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
    - b. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
    - c. ASTM D2240 - Standard Test Method for Rubber Property – Durometer Hardness
    - d. ASTM D3389 - Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double Head Abrader)
    - e. ASTM D6499 - Standard Test Method for the Immunological Measurement of Antigenic Protein in Natural Rubber and its Products
    - f. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
    - g. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
    - h. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
    - i. ASTM E2180 - Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials
    - j. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
    - k. ASTM F155 - Method of Test for Temper of Strip and Sheet Metals for Electronic Devices
      - 1) ASTM F386 - Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
    - l. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
    - m. ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring

- n. ASTM F970 - Standard Test Method for Static Load Limit
  - o. ASTM F1344 - Standard Specification for Rubber Floor Tile
  - p. ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color
  - q. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change
  - r. ASTM F1859 - Standard Specification for Rubber Sheet Floor Covering Without Backing
  - s. ASTM F2055 - Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method
  - t. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
  - u. ASTM F2199 - Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat
  - v. ASTM F2753 - Standard Practice to Evaluate the Effect of Dynamic Rolling Load over Resilient Floor Covering System
  - w. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
  - x. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
4. International Organization for Standardization (ISO):
- 1) ISO 10140-3 - Measurement of sound insulation in buildings and of building elements
  - 2) ISO 26987 - Determination of staining and resistance to chemicals
5. National Fire Protection Association (NFPA):
- a. NFPA 253 - Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
  - b. NFPA 258 - Test Method for Specific Density of Smoke Generated by Solid Materials

### 1.03 SUBMITTALS

- A. See Section 01 3000 – Administrative Requirements for submittal procedures.
- B. See Section 01 6000 - Product Data: Submit manufacturer's product data, installation instructions and maintenance guidelines for each material and accessory proposed for use.

### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience with resilient flooring of type equivalent to those specified.
  - 1. Manufacturer's quality management system must have ISO 9001:2000 approval.
  - 2. Provide resilient flooring products and accessories from one manufacturer to ensure compatibility.
  - 3. Manufacturer shall be capable of providing technical training and technical field service representation.
- B. Installer Qualifications: Acceptable to manufacturer of resilient flooring or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project with a minimum of 4 years' experience with resilient flooring of type equivalent to those specified.
  - a. It is recommended to have a minimum of one installer per working party with the ability to provide proof of current credentials at request.
  - b. Has obtained and maintained current credentials from manufacturer's training program.
  - c. Installers shall be able to exhibit proficient skills with flash cove detailing, both hot and cold-welding techniques, adhesives, specialty adhesive systems and seam cutting.

- d. The installing parties shall provide a submittal of their skills in the form of mock-ups of the specified material. These mock-ups will be accepted as proof of their skills and benchmarking for the proposed project.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.
- B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature for 48-hours prior to installation.

**1.06 PROJECT CONDITIONS**

- A. The installation area must be fully enclosed, weather tight, and climate controlled between 63 deg F and 75 deg F and 40% to 60% ambient relative humidity (RH) for at least 48 hours prior, during and 72 hours after installation (do not use gas fueled blowers). Dew point must be avoided. The substrate must be at least 5 deg F above dew point to be considered acceptable.

**1.07 WARRANTY**

- A. Provide manufacturer's standard limited warranty for wear, defect, bond, and conductivity.

**PART 2 - PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURER**

- A. Basis-of-Design: nora systems, Inc., 9 Northeastern Blvd., Salem, NH 03079; telephone 800-332-NORA or 603-894-1021; fax 603-894-6615.

**RESILIENT TILE FLOORING FOR COMMERCIAL TRAFFIC**

- A. Rubber Floor Tile:

1.	Product Name:	norament® grano™, Article 1955
2.	ASTM Specification: ASTM F1344 Standard Specification for Rubber Floor Tile	Type IB and Grade 2
3.	Limited Wear Warranty:	15 years
4.	Material:	nora vulcanized rubber compound 926 with environmentally compatible color pigments that are free of toxic heavy metals like lead, cadmium, or mercury
5.	Composition:	Homogeneous rubber compound with a random scattered design
6.	Color:	As Selected by Architect.
7.	Surface:	Hammered
8.	Back of Tile:	Double-sanded smooth
9.	Material Size (ASTM F2055): ± 0.02 inches (± 0.5 mm) is required	39.45 inches by 39.45 inches (1002 mm by 1002 mm)
10.	Squareness (ASTM F2055): ± 0.010 inches (± 0.254 mm) is required	Meets requirements
11.	Thickness (ASTM F386): + 0.015/-0.005 inches (+ 0.381/- 0.127 mm) is required	0.36 inches (9.0 mm)
12.	Dimensional Stability (ASTM F2199): ≤ 0.15% in both directions is required	Meets requirements
13.	Flammability (E648/NFPA 253): ≥ 0.45 watts/sq. cm for Class 1 is required	NBSIR 75 950, 0.92

14.	Smoke Density (ASTM E662/NFPA 258): < 450 is required	NBS, 267 (flaming) and 130 (non-flaming)
15.	Surface Burning (CAN/ULC-S102.2):	FSC1 of 70 and SD of 470
16.	Burn Resistance:	Resistant to cigarette and solder burns
17.	Slip Resistance (ASTM D2047): ≥ 0.5 is required	Static coefficient of friction, Neolite dry 0.99, Neolite wet 0.95
18.	Bacteria Resistance (ASTM E2180/ASTM G21):	Resistant to bacteria, fungi, and micro-organism activity
19.	Indoor Air Quality:	Greenguard Gold Certified for low VOC emissions in compliance with CDPH 01350
20.	Carbon:	3rd party verified carbon neutral throughout their entire life cycle through the Interface Carbon Neutral Floors™ program. Learn more at <a href="http://www.interface.com/carbonneutral">www.interface.com/carbonneutral</a> .
21.	Latex Allergies (ASTM D6499):	Inhibition ELISA, results are below detection level
22.	Sound Absorption (ASTM E2179/ISO 10140-3):	Δ IIC 11, Δ Lw 11 dB (compare only Δ values)
23.	Sound Generation:	66.3 dBA, 68.5 dBC and 19.6 Sones, independently tested
24.	Hardness (ASTM D2240): ≥ 70 is required	Shore type "A", 82
25.	Static Load (ASTM F970): ≤ 0.005 inches with 250 lbs. is required	Residual compression of 0.005 inches with 800 lbs.
26.	Rolling Load Limit (ASTM F2753):	≤ 850 lbs. / sq. inch; for forklift traffic nora polyurethane adhesive is required
27.	Abrasion Resistance (ASTM D3389): ≤ 0.035 oz. (1.0g) is required	1.1 lbs. (500g) load on H-18 wheel with 1000 cycles, 0.002 oz. (0.05g) weight loss
28.	Oil & Grease Resistance (EN/ISO 26987):	Yes
29.	Heat Resistance (ASTM F1514): Avg. ΔE ≤ 8.0 is required	Easily achieved with all batches and regular maintenance
30.	Static Generation (AATCC 134):	< 1000 Volts at 20% RH
31.	Thermal Transmission (ASTM C518):	R-value of -0.90
32.	Cleaning:	Cleaned and maintained effectively using water, nora pads and a suitable cleaning machine, without the use of any factory and/or field-applied coatings. Also, without using any chemicals that may be hazardous or containing any teratogenic, mutagenic or any other ingredients known to be carcinogenic. Refer to nora Maintenance Guidelines for product specific details.
33.	Shine:	Higher shine achieved by buffing without any artificial topical applied coatings.
34.	Stain Removal:	Samples of the product must be provided for stain removal testing by the owner. Sample size should be ~ 1 m2, pre-cleaned by manufacture

		<p>per published recommendations. Samples must have no coatings, sealers, floor finish or other manually or mechanically applied finish on the surface of the product. Stain testing must consist of application of common healthcare related disinfectants and chemicals to include, but not limited to, Betadine, Methylene Blue, Silver Nitrate, and alcohol-based hand sanitizer. Duration of test period must be no less than one week. Removal of chemicals must be in accordance with manufacturers published cleaning and maintenance recommendations.</p>
35.	Substrate Preparation:	Per ASTM F710 and the nora Installation Instructions

**PART 3 - GENERAL**

**1.01 GENERAL CONTRACTOR RESPONSIBILITIES**

- A. Supply a safe, climate-controlled building and subfloor as detailed in the nora Installation Instructions (available at [www.nora.com](http://www.nora.com))
- B. A subfloor that meets the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the nora Installation Instructions or nora nTx Installation Instructions as appropriate.
- C. A secure storage area that is fully enclosed, weather tight, and climate controlled between 63 deg F and 75 deg F and 40% to 60% ambient relative humidity (RH) for at least 48-hours prior and during the installation, so the flooring contractor can acclimate all materials.
- D. An installation area that is fully enclosed, weather tight, and climate controlled between 63 deg F and 75 deg F and 40% to 60% ambient relative humidity (RH) for at least 48-hours prior, during, and 72-hours after installation (do not use gas fueled blowers). If this is not possible, contact the nora Technical Department.
- E. Areas with direct prolonged exposure to sunlight should be protected with the use of Low E glass doors, windows or facades that reduce the UV transmissions to less than 1%.
- F. Areas of the flooring subjected to direct sunlight, for example through doors or windows, must be covered using blind, curtains, cardboard, or similar materials for 24-hours before, during, and for a period of 72-hours after the installation to allow nora “wet” adhesives to cure. Do not allow traffic when using wet set adhesives for a minimum of 12-hours and prohibit rolling loads for 72-hours. When using nora® nTx™ or nora dryfix™, the flooring can be trafficked immediately with no restrictions. All flooring must be protected from damage during construction operations using Masonite, plywood, or a similar product. Before laying the panels, the flooring surface must be free of all debris. Lay panels so that they are edge to edge and tape the joints to prevent movement and debris entrapment. Inspect the flooring before covering and after removal for final acceptance.
- G. Conduct post-installation cleaning after 72-hours for wet set adhesives. Conduct post-installation cleaning immediately for installations using nora dryfix or nora nTx. Refer to the appropriate nora Maintenance Guidelines for product specific details.

**1.02 FLOORING CONTRACTOR RESPONSIBILITIES**

- A. Provide trained installers that have at least one of the following:
  - 1. Approved by specified manufacturer (nora systems, Inc.) or INSTALL (International Standards & Training Alliance) certified for the requirements of the project.
  - 2. It is recommended to have a minimum of one installer per working party with the ability to provide proof of current credentials at request.



3. An effective installation manager to manage the project, installers, and ensure that all the required procedures are followed as detailed in the nora Installation Instructions (available at [www.nora.com](http://www.nora.com)).
- B. Follow all requirements in the appropriate nora Installation Instructions or nora nTx Installation Instructions.

**END OF SECTION**

**SECTION 09 6513.13  
RESILIENT BASE****PART 1 GENERAL****1.01 GENERAL PROVISIONS**

- A. CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS are hereby made a part of this Section of the Specifications.

**1.02 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Resilient wall base and accessories.
  - 2. Substrate preparation.

**1.03 RELATED WORK: THE FOLLOWING ITEMS ARE NOT INCLUDED IN THIS SECTION AND ARE SPECIFIED UNDER THE DESIGNATED SECTIONS:**

- A. Section 04 2000- Unit Masonry for substrate, and substrate tolerances.
- B. References (Industry Standards):
  - 1. ASTM International (ASTM):
    - a. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
    - b. ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
    - c. ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
    - d. ASTM F1861: Standard Specification for Resilient Wall Base
  - 2. National Fire Protection Association (NFPA):
    - a. NFPA 255: Test Method of Test of Surface Burning Characteristics of Building Materials

**1.04 SUBMITTALS**

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Section 01 3000 – Administrative Requirements.
- B. Product Data: Submit manufacturer's technical data sheet, care & maintenance document, submittal and/or warranty for each material and accessory proposed for use (available at [www.roppe.com](http://www.roppe.com)).
- C. Samples: Submit representative samples of each product specified for verification.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Provide resilient flooring materials manufactured in the United States of America by a firm with a minimum of 10 years' experience with resilient flooring materials of type equivalent to those specified.
  - 1. Manufacturer's quality management system must have ISO 9001:2000 approval.
  - 2. Provide resilient flooring products, including wall base, accessories and subfloor preparation products from one manufacturer to ensure color matching and compatibility.
  - 3. Manufacturer shall be capable of providing technical training and technical field service representation.
- B. Installer Qualifications: Installer must be professional, licensed, insured and acceptable to manufacturer of resilient flooring materials.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

- B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature for 48-hours prior to installation.

**1.07 PROJECT CONDITIONS**

- A. Maintain temperature and humidity at service levels or the ambient temperature must remain steady ( $\pm 10$  deg F) and be between 65 deg F and 85 deg F for at least 48-hours prior to, during and after installation. The ambient relative humidity is recommended to be between 40 percent and 65 percent RH; avoid dew point conditions.

**1.08 WARRANTY**

- A. Provide manufacturer’s standard limited commercial warranty to cover manufacturing defects.

**PART 2 PRODUCTS**

**2.01 BASIS OF DESIGN MANUFACTURER**

- A. Basis-of-Design: Roppe Corporation, 1602 N Union St., Fostoria, OH 44830. P: (800) 537 – 9527.
- B. Other Acceptable Manufacturers: Manufactucters providing products which meet these specifications and approved prior to bidding by Architect.
- C. Substitutions: See Section 01 6000 – Product Requirements.

- 1. RESILIENT Wall BASE
  - a. Thermoplastic Wall Base:

1.	Product Name:	700 Series Base
2.	Material Specification: ASTM F1861	Type TP – rubber, thermoplastic Group 2 – layered (multiple layers) Style A – Straight, Style B – Cove
3.	Material Height:	4 inch (101.6 mm)
4.	Material Thickness: ASTM F386	1/8 inch (3.2 mm)
5.	Material Length:	120 foot (36.58 m) roll
6.	Limited Warranty:	1 year, Manufacturing Only
7.	Material & Composition:	Unique blend of a thermoplastic and rubber backing covered with a durable colored top layer.
8.	Color:	As selected by Architect
9.	Surface Burning ASTM E84/NFPA 255	Class A
10.	Flammability/Critical Radiant Flux: ASTM E648 / NFPA 253	Class 1

11.	Smoke Density: ASTM E662/NFPA 258	Passes <450
13.	Substrate Preparation:	Per ASTM F710 and Roppe Technical Data Sheet

2. INSTALLATION PRODUCTS:

a. Acrylic Adhesives

1.	Product Name: Product Description: Product Usage:	WB-600 Acrylic Wall Base Adhesive For standard, interior wall base installations over porous substrates only.
2.	Product Name: Product Description: Product Usage:	AW-510 Acrylic Wet-Set Adhesive For interior wall base installations that require a more aggressive bond over porous substrates only
3.	Product Name: Product Description: Product Usage:	C-630 Water-Based Contact Adhesive For interior wall base installations that require a more aggressive bond over porous or non- porous substrates.

3. MAINTENANCE PRODUCTS:

a. Cleaners

1.	Product Name: Product Description: Product Usage	NC-900 All-Purpose pH Neutral Cleaner For initial, daily or routine maintenance and spot cleaning.
2.	Product Name: Product Description: Product Usage:	PR-930 Performance Finish Remover

	For removal of finish that has been accidentally or erroneously applied to material.
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## PART 3 EXECUTION

### 3.01 GENERAL

#### A. General Contractor Responsibilities:

1. Supply a safe, climate controlled building and subfloor as detailed in Roppe Technical Data Sheets.
2. Ensure substrate meets the requirements of ASTM F710, Roppe Technical Data Sheets and Excelsior Technical Data Sheets.
3. Confirm the porosity of all substrates to ensure proper adhesive usage.
4. Provide a secure storage area that is maintained permanently or temporarily at normal operating temperature and humidity conditions (except walk in freezers or similar) between 65 deg F and 85 deg F and between 40 percent and 65 percent relative humidity, for at least 48-hours prior to and during the application of the flooring, so the flooring contractor can acclimate the flooring materials per manufacturer's instructions.
5. Provide an installation area that is weather tight and maintained either permanently or temporarily at ambient service temperature and humidity (except walk in freezers or similar), normal operating temperature and humidity conditions (except walk in freezers or similar) between 65 deg F and 85 deg F and between 40 percent and 65 percent relative humidity, for at least 48-hours prior to and during the application of the flooring per the manufacturer's instructions.
6. Ensure areas with direct prolonged exposure to sunlight are protected with protective UVA/UVB restrictive coatings or films.
7. Areas where the base are installed that are subject to direct sunlight through doors or windows should have them covered using blinds, curtains, cardboard or similar for the time of the installation and 72-hours after the installation to allow the adhesive to cure. Note: These areas should be installed using wet adhesives only.
8. Conduct initial maintenance prior to final usage per the Roppe Care & Maintenance Documents. Do not conduct initial maintenance until adhesive has cured per the adhesive technical data.

#### B. Flooring Contractor Responsibilities:

1. Provide trained installers that are professional, licensed, insured and acceptable to manufacturer of resilient flooring materials.
2. Ensure installers or installation teams meet one of the following requirements:
  - a. Have completed INSTALL (International Standards & Training Alliance) or CFI (Certified Floorcovering Installers) training programs and/or are certified by INSTALL or CFI.
  - b. Are being supervised by Project Managers or Field Supervisors that are INSTALL (International Standards & Training Alliance) certified, CFI (Certified Floorcovering Installers) Certified and/or an FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager).
3. Follow all requirements in the appropriate Roppe and/or Excelsior Technical Data Sheets, Care & Maintenance Documents, Warranties and other technical documents or instructions.

### 3.02 EXAMINATION

- #### A. Verification of Conditions: Inspect all substrates to ensure they are clean, smooth, permanently dry, flat, and structurally sound.

### 3.03 SUBSTRATE PREPARATION

- A. General: Follow guidelines laid out in Division 01, Section 01 7100 – Examination and preparation. All work required to ensure substrate or subfloor meets manufacturers guidelines are the responsibility of the general contractor.
- B. Preparation: Ensure substrate meets the requirements of ASTM F710, Roppe Technical Data Sheets and Excelsior Technical Data Sheets. Substrates must be free of visible water or moisture, dust, sealers, paint, sweeping compounds, curing compounds, residual adhesives and adhesive removers, concrete hardeners or densifiers, solvents, wax, oil, grease, asphalt, visible alkaline salts or excessive efflorescence, mold, mildew and any other extraneous coating, film, material or foreign matter.

### **3.04 INSTALLATION**

- A. General: Follow all relevant guidelines detailed in Division 01, as well as flooring and adhesive manufacturer's technical data sheets.
- B. Interface With Other Work: If caulking or sealing is required after installation, please contact the manufacturer for a suitable, matching caulk.

### **3.05 CLEANING & MAINTENANCE**

- A. General: Clean up installation area and sweep, dust or wipe material to remove any dirt, dust or debris.
- B. Initial Maintenance: Conduct initial maintenance per the manufacturer's Care & Maintenance documents ([www.roppe.com](http://www.roppe.com)).

### **3.06 CLOSEOUT ACTIVITIES**

- A. General: Follow all federal, state and local requirements and Division 01 Section 017600 – Protecting Installed Construction and Section 01 7800 – Closeout Submittal requirements for these activities.
- B. Protection: Protect newly installed material with construction grade paper or protective boards, such as Masonite or Ram Board, to protect material from damage by other trades. Limit usage and foot traffic according to the adhesive's requirements. When moving appliances or heavy furniture, protect wall base from scuffing and tearing using temporary floor protection.

**END OF SECTION**

**SECTION 09 9000  
PAINTING AND COATING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming / sealing and backpriming / sealing all wood prior to installation.
- D. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Exposed surfaces of steel lintels and ledge angles.
  - 3. Cast Iron Bollards.
  - 4. Mechanical and Electrical:
    - a. On Exterior, paint all items exposed to view by the public, unless fully factory-finished and unless otherwise indicated.
    - b. In finished areas , paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment unless otherwise indicated.
    - c. In finished areas, paint shop-primed items.
    - d. On the roof and outdoors, paint all equipment that is exposed to weather or to view, including that which is factory-finished (prime coat is NOT acceptable factory finish).
    - e. In finished areas, paint all exposed ductwork.
    - f. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    - g. Paint dampers exposed behind louvers, grilles, to match face panels.
  - 5. Do Not Paint or Finish the Following Items:
    - a. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
    - b. Items indicated to receive other finishes.
    - c. Items indicated to remain unfinished.
    - d. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
    - e. Non-metallic roofing and flashing.
    - f. Stainless steel, anodized aluminum, bronze, terne, and lead items.
    - g. Marble, granite, slate, and other natural stones.
    - h. Prefinished metal wall and soffit panels.
    - i. Floors, unless specifically so indicated.
    - j. Ceramic and other tiles.
    - k. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
    - l. Note where concrete (poured or precast) maybe noted to be painted.
    - m. Glass.
    - n. Concrete masonry in utility, mechanical, and electrical spaces.
    - o. Acoustical materials, unless specifically so indicated.
    - p. Concealed pipes, ducts, and conduits.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 05 5213 - Pipe and Tube Railings
- C. Division 21 - Fire Suppression: Identification for Fire Suppression Piping and Equipment: Painted identification.

- D. Division 22 - Plumbing: Identification for Plumbing Piping and Equipment: Painted identification.
- E. Division 23 - HVAC: Identification for HVAC Piping and Equipment: Painted identification.
- F. Division 26 - Electrical: Identification for Electrical Systems: Painted identification.

### 1.03 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

### 1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

### 1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all 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. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
  - 3. Manufacturer's installation instructions.
  - 4. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
- C. Samples: Submit paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
  - 2. Allow 30 days for approval process, after receipt of complete samples by Architect.
  - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
  - 4. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
  - 5. Manufacturer's Instructions: Indicate special surface preparation procedures.
  - 6. 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 coated surfaces, and color samples of each color and finished used .
  - 7. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    - a. See Section 01 6000 - Product Requirements, for additional provisions.
    - b. Extra Paint and Coatings: 1 gallon (4 L) of each color; store where directed.
    - c. Label each container with color in addition to the manufacturer's label.

### 1.06 MOCK-UP

- A. See Section 01 4000 - Quality Assurance, Control and Documentation.
- B. Provide mock-up in location and size as directed.
  - 1. Provide samples of proposed finish for review and approval on similar materials prior to preparing mock-up.



2. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
3. Locate where directed.
4. 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 coatings 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: 45 degrees F (7 degrees C) for interiors; 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 all paint and coating products used in any individual system from the same manufacturer; no exceptions.
  1. In the event that a single manufacturer cannot provide all specified products, minor exceptions may be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
  2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
  3. Paints:
    - a. Benjamin Moore & Co: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
    - b. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
    - c. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
  4. Primer Sealers: Same manufacturer as top coats.
  5. Block Fillers: Same manufacturer as top coats.
  6. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  1. Provide paints and coatings 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 coating material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
6. Primers: Use primer required or recommended by manufacturer of top coat; where manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by manufacturer.
7. Volatile Organic Compound (VOC) Content:
  - a. Provide coatings that comply with the most stringent requirements specified in the following:
    - 1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - 2) Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; [www.otcair.org](http://www.otcair.org); specifically:
      - (a) Opaque, Flat: 50 g/L, maximum.
      - (b) Opaque, Nonflat: 150 g/L, maximum.
      - (c) Opaque, High Gloss: 250 g/L, maximum.
    - 3) Architectural coatings VOC limits of State in which the project is located.
  - b. 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.
8. Chemical Content: The following compounds are prohibited:
  - a. Intentionally added methylene chloride or perchloroethylene.
  - b. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
  - c. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.
9. Flammability: Comply with applicable code for surface burning characteristics.
10. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
11. Colors: Manufacturer's full range as indicated on drawings and/or as selected by Architect.
  - a. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
    - 1) Accent Walls as may be indicated or directed by the Architect are in addition to the above three colors, but shall be provided without additional cost to Owner.
  - b. Extend colors to surface edges; colors may change at any edge as directed by Architect.
  - c. All surfaces shall be finished break to break.
  - d. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
  - e. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

### 2.03 PAINT SYSTEMS - EXTERIOR

#### A. Ferrous Metals: One Alkyd Primer Coat and Two Alkyd Finish Coats.

##### 1. Primer:

- |     |   |
|-----|---|
| BM  | P-06 Super Spec HP Alkyd Metal Primer (323 g/l) |
| PPG | 6-208 Speedhide Alkyd Rust Inhibitive Primer    |

- S/W B50Z Kem Kromik Universal Alkyd Primer (389 g/l)
- 2. **Finish:**
  - BM P22 Super Spec HP Urethane Alkyd Gloss Enamel (394 g/l)
  - PPG 4308 HPC Industrial Alkyd Gloss (<450 g/l)
  - PPG 95-3300 Acrylic Aliphatic Urethane Gloss (<250 g/l)
  - S/W B54-150 Pro Industrial Urethane Alkyd Gloss Enamel (326 g/l)
- B. **Galvanized Metal:** One Primer Coat and Two Alkyd Finish Coats
  - 1. **Primer:**
    - BM HP02 Ultra Spec HP Acrylic Metal Primer HP04 (48 g/l)
    - PPG 4160 MultiPrime-one component, multi-purpose structural primer
    - S/W B50W3 Galvite Galvanized Metal Primer (312 g/l)
  - 2. **Finish:**
    - BM P22 Ultra Spec HP D.T.M. Alkyd Gloss Enamel (394 g/l)
    - PPG 439-10 Glyptex Interior Alkyd Enamel Semi-Gloss (<380 g/l)
    - B55-150 Pro Industrial Urethane Alkyd Enamel Gloss (326 g/l)

#### 2.04 PAINT SYSTEMS - INTERIOR

- A. **Masonry - Concrete Block:** One Acrylic Latex Filler Coat and Two Acrylic Latex Finish.
  - 1. **Filler:**
    - BM 751 Ultra Spec Hi-Build Block Filler (45 g/l)
    - PPG 6-15XI Speedhide Acrylic Latex Masonry Block Filler
    - S/W B25W25 PrepRite Interior / Exterior Acrylic Masonry Hi Fill Block Filler (<50 g/l)
  - 2. **Finish:**
    - BM T535 Ultra Spec 500 Interior Flat (0 g/l)
    - BM T538 Ultra Spec 500 Interior Eggshell (0 g/l)
    - PPG 6-70 Speedhide Acrylic Latex Flat Wall Paint
    - PPG 6-411XI Speedhide Zero Interior Latex Eggshell Enamel
    - S/W B30W12651 ProMar 200 Zero VOC Interior Latex Flat Paint Flat (<50 g/l)
    - S/W B20W12651 ProMar 200 Zero VOC Latex EgShel Enamel (<50 g/l)
- B. **Ferrous Metals:** One Alkyd (oil base) Primer Coat and Two Alkyd Gloss Finish Coats
  - 1. **Primer:**
    - BM P-06 Super Spec HP Alkyd Metal Primer (323 g/l)
    - PPG 4360 MultiPrime - Low VOC Universal Primer
    - S/W B50WZ0001 Kem Kromik Universal Metal Primer (389 g/l)
  - 2. **Finish:**
    - BM V200 Corotech Alkyd Urethane Gloss Enamel (335 g/l)
    - PPG 439-10Glytux Interior Alkyd Enamel Semi-gloss
    - S/W B54-150 Pro Industrial Alkyd Urethane Gloss Enamel (326 g/l)
- C. **Galvanized Metal:** One Water Base Prime Coat & Two Alkyd Finish Coats.
  - 1. **Primer:**
    - BM HP04 Ultra Spec HP Acrylic Metal Primer (48 g/l)
    - PPG 4360 MultiPrime Low VOC Universal Prime Primer
    - S/W B50W003 Galvite Galvanized Metal Primer (312 g/l)
  - 2. **Finish:**
    - BM 793 Advance Waterborne Interior Alkyd Semi-Gloss (43 g/l)
    - PPG 439-10 Glyptex Interior Alkyd Semi-gloss Enamel
    - S/W B34W8251 ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss (<100 g/l)
- D. **Gypsum Drywall:** One Acrylic Latex Primer & Two Acrylic Latex Finish Coat.s
  - 1. **Primer:**

- BM N534 Ultra Spec 500 Interior Latex Primer (0 g/l)
  - PPG 9-900XI Pure Performance Latex Interior Zero VOC Primer
  - S/W B28W2600 ProMar 200 Zero VOC Interior Latex Primer (0 g/l)
2. **Finish:**
- BM T535 Ultra Spec 500 Interior Flat (0 g/l)
  - BM T538 Ultra Spec 500 Interior Eggshell (0 g/l)
  - PPG 9-110XI Pure Performance Paint & Primer in One Flat (0 g/l)
  - PPG 9-3101XI Pure Performance Paint & Primer in One Eggshell (0 g/l)
  - S/W B30W21651 ProMar 200 Zero VOC Interior Latex Flat Wall Paint (<50 g/l)
  - S/W B20W12651 ProMar 200 Zero VOC Latex EgShel Enamel (<50 g/l)
- E. **Wood Trim: Painted:** One Waterborne Alkyd Prime Coat and Two Waterborne Alkyd Finish Coats.
1. **Primer:**
- BM 790 Advance Waterborne Interior Alkyd Primer (44 g/l)
  - PPG 17-921XI Seal Grip Interior / Exterior Alkyd Universal Primer
  - S/W B79W450 Multi-Purpose Waterbased Acrylic-Alkyd Primer (<50 g/l)
1. **Finish:**
- BM 793 Advance Waterborne Interior Alkyd Semi-Gloss (43 g/l)
  - BM 6-1410XI Speedhide Alkyd Lo-Lustre Enamel
  - PPG 6-1510XI Speedhide Alkyd Semi-Gloss Enamel
  - S/W B34W8251 ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss (<100 g/l)

## 2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Do not begin application of coatings 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 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 are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating 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. Seal surfaces that might cause bleed through or staining of topcoat.

- E. Remove mildew from impervious surfaces by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
- I. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- L. Shop-Primed Steel Surfaces to be Finish Painted: 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.
- M. Interior 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.
- N. 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 instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Backprime / seal all wood prior to installation.
- E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- F. Apply each coat to uniform appearance.
- G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- H. Sand wood and metal surfaces lightly between coats to achieve required finish.
- I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

**3.05 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

**3.06 INSPECTION, CORRECTION AND ACCEPTANCE**

- A. Architect and Owner will review Contractor's Punch List and finished spaces.
- B. Touch-up when permitted shall not be perceivable in finished surface.
- C. Where repainting is required, surface shall be painted from break to break; break to break.
  - 1. Repainting shall not be perceivable in finished space.
- D. Architect shall make final decision on acceptance of finished spaces or correct finishes.

**3.07 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

**END OF SECTION**

**SECTION 10 1401  
USER - SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Building identification signs.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry

**1.03 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.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including 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.
- D. 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.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store adhesive at normal room temperature.

**1.07 FIELD CONDITIONS**

- A. Do not install 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](http://www.bestsigns.com/#sle).
  - 2. Cosco Industries (ADA signs): [www.coscoarchitecturalsigns.com/#sle](http://www.coscoarchitecturalsigns.com/#sle).
  - 3. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Dimensional Letter Signs:
  - 1. Cosco Industries; Cast Aluminum: [www.coscoarchitecturalsigns.com/#sle](http://www.coscoarchitecturalsigns.com/#sle).
  - 2. FASTSIGNS: [www.fastsigns.com/#sle](http://www.fastsigns.com/#sle).
  - 3. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 SIGNAGE APPLICATIONS

- 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 panel media as indicated.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  - 3. Character Height: 1 inch.
  - 4. Sign Height: As indicated, see Drawings.
  - 5. Office Doors: Identify with the room names and numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
  - 6. Conference and Meeting Rooms: Identify with the room names and numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
  - 7. Service Rooms: Identify with the room names and numbers indicated on drawings.
  - 8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers indicated on the drawings, and braille.
- C. Interior Directional and Informational Signs:
  - 1. Sign Type: Same as room and door signs.
  - 2. Sizes: As indicated on drawings.
  - 3. Wording of signs is scheduled on drawings.
- D. Building Identification Signs:
  - 1. Use individual metal letters.
  - 2. Mount on outside wall in location indicated on drawings.

## 2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
  - 1. Edges: Square.
  - 2. Corners: Radiused.
  - 3. Wall Mounting of One-Sided Signs: Construction adhesive.
- 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: Light Grey.
  - 4. Character Color: Dark Grey color.

## 2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
  - 1. Total Thickness: 1/8 inch, minimum.

## 2.05 NON-TACTILE SIGNAGE MEDIA



- A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
  - 1. Total Thickness: 1/8 inch.

## **2.06 DIMENSIONAL LETTERS**

- A. Metal Letters:
  - 1. Metal: Aluminum casting.
  - 2. Letter Height: As indicated on Drawings.
  - 3. Text and Typeface:
  - 4. Mounting: Pin Mounted, unless otherwise indicated.

## **2.07 ACCESSORIES**

- A. Construction Adhesive: Adhesive compatible with both sign media and surface to mount upon.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

### **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.

**END OF SECTION**

**SECTION 10 2600  
CORNER GUARDS****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section Includes:
  - 1. Wall Protection Systems:
    - a. Corner Guards.
- B. Related Sections/Items:
  - 1. Wood blocking and grounds, refer to Section 06 1000.
  - 2. Stainless steel mop plates, kick plates, and armor plates, refer to Section 08 7100.
  - 3. Signage and graphics, refer to Section 10 0426.

**1.02 SUBMITTALS**

- A. Comply with Section 01 3000.
- B. Product data indicating compliance with specified requirements.
- C. Shop drawings showing methods of attachment to substrate.
- D. Samples: For selection of color, pattern, and surface texture.
  - 1. 12 inch (300 mm) long samples of each type of corner
    - a. guard required. Include examples of joinery, corners, and field splices.

**1.03 QUALITY ASSURANCE**

- A. Single Source Responsibility: Obtain wall surface protection system components from a single source.
- B. Deliver materials in original factory wrappings and containers, clearly labeled with manufacturer and brand name.
- C. Store materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within the storage area between 60 deg F (16 deg C) and 80 deg F (27 deg C) during the period materials are stored. Keep materials out of direct sunlight to avoid excessive surface temperatures.
    - a. PROJECT CONDITIONS
      - 1) Maintain ambient temperature within building at not less than 65 deg F (18 deg C) or greater than 75 deg F (24 deg C) for a minimum 72 hours prior to beginning of installation.
    - b. MAINTENANCE
      - 1) Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
      - 2) Replacement Materials: Minimum 2% of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as installed materials. Package with protective coverings and appropriate labels.

**PART 2 - PRODUCTS****2.01 BASIS OF DESIGN MANUFACTURERS**

- 1) Koroseal Wall Protection Systems, Louisville, KY. Ph: 855-753-5474; Fax: 330-668-7703; Internet Address: [www.korogard.com](http://www.korogard.com).
- 2) Drawings and specifications are based on manufacturer's literature from Koroseal Wall Protection Systems unless otherwise indicated.
- b. OTHER ACCEPTABLE MANUFACTURERS
  - 1) Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- c. MATERIALS

- 1) Fasteners: Use non-corrosive metal screws, bolts, and other fasteners compatible with stainless steel components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

## **2.02 CORNER GUARDS**

- 1) Stainless Steel Corner Guards: Adhered or screw-mounted 90 deg type 304 stainless steel corner guards, 16 gauge thick with #4 Satin finish. Corner radius 1/4 inch (6 mm).
2. GS15 Series: 1-1/2 inch (38 mm), 6 feet (1.23 m).
3. Adhesive (Screws): As recommended by manufacturer.
4. FABRICATION
  - a. Comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thicknesses of components.
  - b. Shop-assemble components to the greatest extent possible. Disassemble only as necessary for shipping and handling.
  - c. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
  - d. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of members to other construction.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- a. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
- b. Complete finishing operations, including painting, before beginning installation of wall surface protection system materials.
- c. Do not proceed with installations until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- 1) Properly prepare substrate and clean to remove dust, debris, and loose particles.

### **3.03 INSTALLATION**

- a. Install wall surface protection units plumb, level, and true to line without distortions.
- b. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.

### **3.04 CLEANING**

- a. Clean metal components in accordance with the manufacturer's recommendations.
- b. Remove excess adhesive in manner recommended by manufacturer.

**END OF SECTION**

**SECTION 10 4400  
FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 04 2000 - Unit Masonry: Roughed-in wall openings.

**1.03 REFERENCE STANDARDS**

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- B. FM (AG) - FM Approval Guide; Current Edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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.

**1.05 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. Activar Construction Products Group, Inc. - JL Industries: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Kidde, a unit of United Technologies Corp: [www.kidde.com/#sle](http://www.kidde.com/#sle).
  - 3. Oval Brand Fire Products: [www.ovalfireproducts.com/#sle](http://www.ovalfireproducts.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
  - 1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Kidde, a unit of United Technologies Corp; \_\_\_\_\_: [www.kidde.com/#sle](http://www.kidde.com/#sle).
  - 3. Oval Brand Fire Products: [www.ovalfireproducts.com/#sle](http://www.ovalfireproducts.com/#sle).
  - 4. Substitutions: See Section 01 6000 - 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. Temperature range: Minus 65 degrees F to 120 degrees F.

### **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 \_\_\_\_\_ steel sheet; 0.036 inch 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 thick fire barrier material.
- D. Cabinet Configuration: Semi-recessed type.
  1. Size to accommodate accessories.
  2. Trim: Flat rolled edge, with 1 1/2 inch wide face.
  3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- G. Fabrication: Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.
- I. Finish of Cabinet Interior: White colored enamel.

### **2.04 ACCESSORIES**

- A. Extinguisher Brackets: Formed steel, chrome-plated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 40 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

**END OF SECTION**

**SECTION 10 7300  
ALUMINUM CANOPIES - DESIGN/BUILD**

**PART 1: GENERAL****1.01 RELATED DOCUMENTS**

- A. The requirements of Division 1 specifications shall apply to work specified in the section.

**1.02 ENGINEERING DESIGN CRITERIA**

- A. International Building Code 2015
- B. ASCE 7-10, Minimum Design Loads for Buildings and Other Structures
- C. Aluminum Design Manual 2015
- D. AWS D1.2 – 2014, Structural Welding Code - Aluminum
- E. Local governing codes and standards for site location

**1.03 GENERAL DESCRIPTION OF WORK – DESIGN/ BUILD**

- A. Work in this section shall include design, fabrication, and installation of pre-engineered, pre-finished aluminum protective canopy, including concrete footing as indicated on Drawings. All work shall be in accordance with the shop drawings and this specification section.

**1.04 SUBMITTALS**

- A. See Section 01 3000 – Administrative Requirements.
- B. Shop Drawings – Submit complete shop drawings including:
  - 1. Overall canopy layout dimensions
  - 2. Cut section details including elevation, bent layout dimensions, canopy connection details, and wall connection details
  - 3. Flashing details pertaining to aluminum canopy
  - 4. Concrete footing and/or canopy anchorage details
- C. Product Data – Submit manufacturer's product information, specifications, and installation instructions for the aluminum canopy.
- D. Samples – Submit color selection samples of actual coated aluminum material or actual anodized aluminum material.
- E. Certification – Provide Professional Engineer certification that the proposed canopy design and layout meets or exceeds all applicable loadings (ex: wind load, rain live load, dead load, snow load) for the job location (Pelham, Alabama) in accordance with IBC 2015 and ASCE 7-10.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum five years experience in design, fabrication, and production of aluminum protective covers.
- B. Components shall be assembled in shop to greatest extent possible to minimize field assembly.
- C. Aluminum protective cover, including material and workmanship, shall be warranted from defects for a period of one year from date of completion of aluminum protective cover installation.
- D. Aesthetic and visual appearance is indicated on the Drawings and shall be met to the satisfaction of the Architect.

**PART 2: PRODUCTS AND MATERIALS****2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Tennessee Valley Metals, Inc. [www.tvm.net](http://www.tvm.net)
- B. Other Acceptable Manufacturers:
  - 1. Manufacturers providing products and services as specified herein and approved prior to bidding by Architect.

C. Substitutions: See Section 01 1600 – Product Requirements.

## 2.02 DESIGN & ASSEMBLY

- A. Aluminum protective cover shall be mechanically fastened using internally welded brackets and concealed 300 series stainless steel fasteners. Welded connections can be used if shipping allows.
- B. Canopy shall use perimeter extruded gutter and extruded decking running perpendicular to length of canopy. Beams are to be notched to receive the extruded gutter to allow decking to sit flush to the top of the beam. Extruded Decking shall be a roll-locked design where the extruded cap and pan shall interlock to make a rigid structure. Crimped decking is not allowed.
- C. False fascia and extruded decking running parallel to length of canopy will be allowed if canopy spans exceed limitations of perpendicular decking and perimeter gutter. If used, pans are to be welded at ends to prevent water leakage. Standard T- flashing shall be used where decking is separated at a drain beam. The false fascia is to be secured using a rivet every 4 foot-0 inches on center connecting the fascia to the edge pans. Tie back straps are to be installed connecting the top of the fascia to the decking at 8 foot-0 inches on center.
- D. Canopies shall drain from the decking to the perimeter gutter, into the drain beam (if applicable) and discharge at the bottom of the column. Canopies shall drain from the decking into the drain beam and discharge at the bottom of the column, unless otherwise indicated.
- E. Deflector plates are to be installed at the bottom of the column to discharge the water away from the column, where indicated. The deflector plates are to be caulked inside the column and fastened to the column using a single rivet.
- F. Columns are to be locked into the column foundation using a single piece of ½” rebar, approximately 7 inches long, running through the bottom of the column below finished floor.
- G. Twin columns required as indicated

## 2.03 MATERIALS

- A. Columns
  - 1. Columns are to be radius cornered aluminum tubular extrusions. Size of column used shall exceed loading requirements in section 1.2 – Engineering Design Criteria. Minimum column size shall be 8 inch x 8 inch at 0.125 inch thick.
  - 2. Provide clear acrylic protection or bituminous paint protection between the aluminum column and the concrete foundation.
  - 3. Tombstone shaped water outlet holes are to be cut at the bottom of all draining columns with deflector plates installed inside, where indicated. Circular drain holes are not allowed.
- B. Beams
  - 1. Beams are to be open topped aluminum tubular extrusions.
  - 2. Size of beam used shall exceed loading requirements in section 1.2 – Engineering Design Criteria. Minimum beam size shall be 8 inch x 8 inch at 0.125 inch thick.
- C. Decking
  - 1. Decking shall be a rigid roll-locked design that is self flashing and utilizes interlocking sections.
  - 2. Extruded decking shall exceed loading requirements in section 1.2 – Engineering Design Criteria. Minimum 3 inch x 6 inch cap and pan.
  - 3. The ends of the pans shall be welded closed where decking does not terminate into a drain beam.
- D. Gutter
  - 1. Gutter shall be radius cornered aluminum extrusion that exceeds loading requirements in section 1.2 – Engineering Design Criteria. Minimum gutter size shall be 4 inch x 6 inch at 0.093 inch thick.
- E. False Fascia

1. False Fascia shall be aluminum extrusion that exceeds loading requirements in section 1.2 – Engineering Design Criteria. Minimum fascia size shall be 1 inch x 6 inch at 0.070 inch thick.
- F. Flashing
1. Flashing shall be made of aluminum sheet painted to match the color of the canopy. Minimum flashing thickness shall be 0.040 inch thick.

#### **2.04 FASTENERS**

- A. All framing fasteners shall be 300 series stainless steel with neoprene washers. All rivets are 3/16 inch aluminum. All decking fasteners shall be long life coated steel with a 300 series stainless steel cap and neoprene washer.

#### **2.05 FINISHES**

- A. Factory applied baked enamel
1. Enamel is to comply with AAMA 2603.
  2. Color is to be as selected by architect from manufacturer's standard color chart.

### **PART 3: INSTALLATION AND EXECUTION**

#### **3.01 ERECTION**

- A. Canopies are to be installed according to approved shop drawings and plans.
- B. The entire structure shall be installed straight, true, and plumb according to standard construction procedures.
- C. Canopies shall be installed with minimal slope to allow water flow from top of canopy to draining columns and eliminate ponding.
- D. Non-draining columns shall have weep holes installed at top of concrete to remove condensation from post. Minimum weep hole size shall be ¼ inch in diameter.
- E. All joints, corners, and connections shall be tight and clean.
- F. All exposed fasteners are to be painted to match the canopy color.
- G. Decking is to be aligned and secured to aluminum frame structure.

#### **3.02 COLUMN FOUNDATIONS**

- A. Styrofoam blockouts shall be provided by the canopy manufacturer and installed by the General Contractor.
- B. General Contractor shall pour the required concrete foundation size around the Styrofoam blockouts provided by the manufacturer.
- C. Canopy installer is to remove the Styrofoam after concrete foundation has cured, set column in cavity, and fill with minimum 2000 psi grout to level of finished concrete slab.
- D. Slab mounting of aluminum columns is allowed upon the architect's approval (if slab mounting resists applicable loading). ½ inch x 4 ½ inch Stainless Steel wedge anchors shall be used when slab mounting aluminum columns. Design of attachment surfaces for slab mounting is not covered in this specification and scope of work.
- E. Foundation/Footing design and installation is part of the Design/Build aspect of this specification and scope of work.

#### **3.03 CLEANING**

- A. All canopy surfaces exposed are to be cleaned after installation is complete.
- B. Surplus materials and debris shall be removed from the jobsite after installation is complete.

#### **3.04 PROTECTION**

- A. General Contractor shall ensure protection of installed aluminum canopies from other construction so that canopies are without damage at time of substantial completion of project.

**END OF SECTION**



**SECTION 10 7500  
FLAGPOLES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum Flagpoles.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.
- B. Section 31 2323 - Fill: Sand to fill foundation tube sleeve.

**1.03 REFERENCE STANDARDS**

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2016 (Reapproved 2020).
- B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.
- C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - 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. Designer's Qualification Statement.
- E. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

**1.05 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.

**1.06 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. Flagpoles:
  - 1. Concord American Flagpole; Internal - Independence: [www.concordamericanflagpole.com/#sle](http://www.concordamericanflagpole.com/#sle).
  - 2. Morgan-Francis Flagpoles & Accessories: [www.morgan-francis.com/#sle](http://www.morgan-francis.com/#sle).
  - 3. Pole-Tech Co, Inc: [www.poletech.com/#sle](http://www.poletech.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 FLAGPOLES**

- A. Flagpoles: Designed in accordance with NAAMM FP 1001
  - 1. Material: Aluminum.
  - 2. Design: Straight shaft.
  - 3. Mounting: Ground mounted type.
  - 4. Nominal Height: 35 ft; measured from nominal ground elevation.
  - 5. Halyard: Internal type, manual winch operation.
- B. Performance Requirements:

1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 30 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

### **2.03 POLE MATERIALS**

- A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

### **2.04 ACCESSORIES**

- A. Finial Ball: Aluminum, 6 inch diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Flag: United States design, 5 ft by 8 ft size, nylon fabric, brass grommets, hemmed edges.
  1. Alabama State Flag furnished by Owner.
- D. Halyard: 5/16 inch diameter nylon, braided, white.
  1. Configure for two flags.
- E. Connecting Sleeve For Multiple Section Poles: Same material as pole, precision fit for field assembly of pole, concealed fasteners.
- F. Primer: Zinc chromate type.

### **2.05 OPERATORS**

- A. Hand Crank: Removable handle type.

### **2.06 MOUNTING COMPONENTS**

- A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth as indicated by flagpole manufacturer.
- B. Lighting Ground Rod: 6 inch long copper rod, 3/4 inch diameter.
- C. Lighting Ground Cable: Copper No. 6 AWG, soft drawn.

### **2.07 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.

### **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. Fill foundation tube sleeve with concrete specified in Section 03 3000.
- 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 inch.

### **3.05 ADJUSTING**

- A. Adjust operating devices so that halyard and flag function smoothly.

**END OF SECTION**

**SECTION 12 2400  
WINDOW SHADES - MECHOSHADE SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Manual roller shades and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry.

**1.03 REFERENCE STANDARDS**

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- B. BIFMA HCF 8.1 - Health Care Furniture Design – Guidelines for Cleanability; 2019.
- C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- D. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.
- C. Sequencing:
  - 1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
  - 2. Do not install shades until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product to be used including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: List of all components with part numbers, and operation and maintenance instructions; include copy of shop drawings.
- F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum ten years of documented experience with shading systems of similar size, type, and complexity; manufacturer's authorized representative.
- C. Resistance to Degradation When Exposed to Typical Cleaners: Passes BIFMA HCF 8.1 testing.

**1.07 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.

### **1.08 FIELD CONDITIONS**

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard, non-depreciating warranty, for interior shading only, covering the following:
  - 1. Shade Hardware: 10 years unless otherwise indicated.
    - a. Mecho /5 with ThermoVeil shade fabric: 25 years.

## **PART 2 PRODUCTS**

### **2.01 BASIS OF DESIGN MANUFACTURERS**

- A. Basis of Design: MechoShade Systems LLC: [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
- B. Other Acceptable Manufacturers: Manufacturers which provide product which meet these specifications and approved by Architect prior to bidding.
- C. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 ROLLER SHADES**

- A. General:
  - 1. Provide shade system components that are capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
  - 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Basis of Design - Roller Shades: MechoShade Systems LLC; Mecho/5 System: [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
  - 1. Description: Single roller, manually operated fabric window shades.
    - a. Drop Position: Regular roll.
    - b. Mounting: Window jamb mounted.
    - c. Size: As indicated on drawings.
  - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
    - a. Material: Steel, 1/8 inch thick.
  - 3. Roller Tubes:
    - a. Material: Extruded aluminum.
    - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
    - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
    - 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.
    - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
    - b. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
  - 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
    - a. Provide a permanently lubricated brake assembly mounted on a oil-impregnated hub with wrapped spring clutch.
    - b. Brake must withstand minimum pull force of 50 pounds in the stopped position.
    - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.

6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound minimum breaking strength. Provide upper and lower limit stops.
  - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
7. Accessories:
  - a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; finish as selected by Architect.
    - 1) Provide single fascia to accommodate regular roll shades.
    - 2) Color: Black.
    - 3) Profile: Square.
    - 4) Configuration: Captured, fascia stops at captured bracket end.
  - b. Room-Darkening Channels, Standard: Extruded aluminum side channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.

### 2.03 SHADE FABRIC

- A. Fabric for Room-Darkening Shades: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
  1. Material Composition:
    - a. PVC coated polyester yarns.
  2. Material Certificates and Product Disclosures:
  3. Performance Requirements:
    - a. Flammability: Pass NFPA 701 large or small scale test.
    - b. Fungal Resistance: No growth when tested according to ASTM G21.
    - c. Solar Transmittance (Ts): 11, nominal.
    - d. Visible Light Transmittance (Tv): 8, nominal.
    - e. Solar Absorption (As): 36, nominal.
    - f. Solar Reflectance (Rs): 54, nominal.
  4. Openness Factor: 5%, nominal.
  5. Weight: 19.17 ounces per square yard.
  6. Color: 1319 Silver Birch.
  7. Products:
    - a. MechoShade Systems LLC Inc; ThermoVeil Basket Weave - 1300 Series (5% open): [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### 2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
  1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
  2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. 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. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

**3.04 CLEANING**

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

**3.05 CLOSEOUT ACTIVITIES**

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

**3.06 PROTECTION**

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**3.07 MAINTENANCE**

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

**END OF SECTION**

**SECTION 12 3600  
COUNTERTOPS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Countertops for architectural cabinet work.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 41000 - Architectural Casework

**1.03 REFERENCE STANDARDS**

- A. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- C. AWI (QCP) - Quality Certification Program; Current Edition.
- 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; 2009 (Revised 2019).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. NSI Fabricator Qualification: Documentation of Natural Stone Institute Accreditation.
- H. Installer's qualification statement.
- I. Installation Instructions: Manufacturer's installation instructions and recommendations.
- J. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

**1.05 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; [www.naturalstoneinstitute.org/#sle](http://www.naturalstoneinstitute.org/#sle).
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:
  - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: [www.awiqcp.org/#sle](http://www.awiqcp.org/#sle).
  - 2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades

specified.

3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

#### **1.07 FIELD CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### **PART 2 PRODUCTS**

#### **2.01 COUNTERTOPS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAc/WI (AWS) or AWMAc/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
  1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
    - a. Basis of Design Manufacturers:
      - 1) Wilsonart: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
    - b. Other Acceptable Manufacturers:
      - 1) Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
    - d. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    - e. NSF approved for food contact.
    - f. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
    - g. Laminate Core Color: Same as decorative surface.
    - h. Finish: Matte or suede, gloss rating of 5 to 20.
    - i. Surface Color and Pattern: As indicated on drawings.
  2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
  3. Back and End Splashes: Same material, same construction.
  4. Fabricate in accordance with AWI/AWMAc/WI (AWS) or AWMAc/WI (NAAWS), Section 11 - Countertops, Custom Grade.
  5. No particle board or mdo backup. Plywood only for countertops.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate of plywood.
  1. Flat Sheet Thickness: 1/2 inch, 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. Basis of Design Manufacturers:
      - 1) Dupont: [www.corian.com/#sle](http://www.corian.com/#sle).
      - 2) Wilsonart: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
    - b. Other Acceptable Manufacturers:



- 1) Manufacturers providing products which meet these specifications and approved prior to bidding by Architect.
- c. Substitutions: See Section 01 6000 - Product Requirements.
- d. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
- e. NSF approved for food contact.
- f. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on drawings.
7. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
  - a. No particle board or mdo backup. Plywood only as backup.

## 2.02 MATERIALS

- A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.
- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- C. **NO PARTICLEBOARD OR MEDIUM DENSITY FIBERBOARD PERMITTED FOR SUBSTRATE.**
- D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- E. Joint Sealant: Mildew-resistant silicone sealant, white.

## 2.03 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets:

## 2.04 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 except where top butts against cabinet or wall.
    - a. Rout a 1/8 inch drip groove at underside of exposed overlapping edges, set back 1/2 inch from face of edge.
  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, unless otherwise indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.03 INSTALLATION**

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Seal joint between back/end splashes and vertical surfaces.

### **3.04 TOLERANCES**

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

### **3.05 CLEANING**

- A. Clean countertops surfaces thoroughly.

### **3.06 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

**SECTION 21 0500****GENERAL PROVISIONS – FIRE SUPPRESSION****PART 1 – GENERAL****1.1 SCOPE:**

- A. Provisions of this Section apply to all Fire Protection work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Fire Protection work shown or specified, complete and ready for operation, consisting in general of the following:
  - 1. Provide wet automatic sprinkler system coverage for the new addition to the building.
  - 2. Provide dry pipe automatic sprinkler system coverage for the unheated areas of the building.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Fire Protection work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. Permitting is required for sprinkler system flush-out water discharged to surface waters.

The State Contact:  
Alabama Department of Environmental Management  
Attn: Water Division  
Post Office Box 301463  
Montgomery, Alabama 36130-1463  
Telephone Number: (334) 271-7823  
Fax Number: (334) 279-3051  
E-Mail: H2omail@adem.state.al.us

- F. "Provide" means to furnish and install, complete and ready for operation.

**1.2 DRAWINGS:**

- A. Fire Protection Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Fire Protection Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Fire Protection drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.

- D. DO NOT scale drawings to locate sprinkler heads. COORDINATE with lighting and ceiling grids. Contractor for Fire Protection work is responsible for coordinating with all trades.

### 1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
1. ANSI/B31.9 - Code for Building Services Piping
  2. NFPA 13 – Standard for the Installation of Sprinkler Systems
  3. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances
  4. NFPA 25 – Standard for Inspection, Testing, and Maintenance of Water-based Fire Protection Systems.
  5. NFPA 30 - Flammable and Combustible Liquids Code
  6. NFPA 70 - National Electrical Code
  7. NFPA 101 - Safety to Life from Fire in Buildings and Structures
  8. Other standards as referenced in other sections of Division 210000
  9. 2021 International Building Code
  10. 2021 International Mechanical Code

### 1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Fire Protection sub-contractor shall meet the following minimum qualifications:
1. He shall have been in business as a Contractor for Fire Protection work continuously, for at least 3 years prior to the date of opening bids for this project.
  2. He shall have a satisfactory experience record with Fire Protection installations of character and scope comparable with this project and shall have completed three such installations in the past three years.
  3. He shall be qualified, certified and licensed by the State of **Alabama** Fire Marshal. He shall meet all laws pertaining to fire protection in the Code of **Alabama** 1975 and any amendments of same.

### 1.5 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.
- B. Coordinate with all other trades in regards to location and arrangement of all sprinkler system components.

**1.6 WORKMANSHIP:**

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

**1.7 COOPERATION:**

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

**1.8 VISITING SITE:**

- A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

**1.9 MATERIALS:**

- A. **Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.

- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

#### **1.10 SHOP DRAWINGS:**

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of piping) and drawn to 1/4" to 1'-0" scale.
- B. Submit pdf of working shop drawings, material data, and hydraulic calculations. Shop drawings shall include drain locations, pipe slopes down to drains, piping elevations, piping connection details, and a list of piping materials. All shop drawings shall be produced using AutoCad and a copy of the shop drawing files shall be provided in AutoCad 2013 format on CD-ROM disks for shop drawing review. A CD-ROM with a copy of all approved shop drawings shall be provided for project closeout.
  - 1. Complete Fire Protection equipment plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
  - 2. Equipment piping.
- C. Thirty days before starting work, submit Fire Protection shop drawings bearing seals of approval of Owner's Underwriters and all Governmental Agencies having jurisdiction. Complete shop drawings are required to be submitted at one time. (See Section 214000.)
- D. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A signed agreement between the Engineer and Contractor shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files.

#### **1.11 RECORD DRAWINGS:**

- A. When work starts the Architect will furnish two complete sets of white prints of the Fire Protection Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
  - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
  - 2. Block out areas modified by change-order & identify them by change-order number.
  - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.

- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A signed agreement between the Engineer and Contractor shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files.
- D. Fire Protection Drawings shall be a set of CAD shop drawings, up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.

#### **1.12 PROTECTION OF EQUIPMENT:**

- A. During construction, protect Fire Protection piping and equipment damage or deterioration and prevent water, dust, etc. from entering the equipment.
- B. During construction, keep all openings of piping and equipment securely covered to prevent entry of water or dust.
- C. When installation is complete, clean piping and equipment and make ready for painting.

#### **1.13 INSTALLATION OF EQUIPMENT:**

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. ***Provide space at all equipment power and control panels as required by local codes.***
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place.

#### **1.14 CUTTING AND PATCHING AND INCIDENTAL WORK:**

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish Fire Protection Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

#### **1.15 EXCAVATION & BACKFILLING:**

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)

- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

**1.16 VALVE TAGS:**

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
  - 1. Fire Protection: White tags with red numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

**1.17 VALVE CHARTS:**

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.
- B. In existing buildings include existing valves in the charts of new valves.

**1.18 EQUIPMENT IDENTIFICATION:**

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Secure nameplates with acorn head screws.
- C. Colors:
  - 1. Equipment connected to utility power only - black letters on white nameplates.
  - 2. Equipment connected to emergency power - red letters on white nameplates.



**1.19 ACCESS DOORS:**

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

**1.20 TESTS, CLEANING & ADJUSTMENTS:**

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation. ***All instruments used for testing work shall have been calibrated within 6 months and checked for accuracy prior to start of work.***
- C. Perform all tests as required by local codes. Contractor shall furnish testing equipment. ***All piping pressure tests shall be hydrostatic tests.***
- D. If local codes are more stringent than the following, local codes shall govern.

**1.21 WARRANTY & INSTRUCTIONS:**

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.
- D. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.

**1.22 PROJECT CLOSE-OUT:**

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. Record drawings - Fire protection systems: PDF files and CAD files.
  2. Equipment Submittal Data PDF files.
  3. Equipment operating and maintenance manuals PDF files.
  4. Maintenance schedule.
  5. Equipment warranty dates and guarantees.
  6. List of Owner's Personnel who have received maintenance instructions.
  7. Test results of fire protection systems and names of those witnessing test. (See Section 214000 and NFPA 25 for testing requirements.)
  8. Install valve charts in Mechanical Rooms.

**1.23 TRAINING OF OWNER PERSONNEL:**

- A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. The Engineer shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
1. The Fire Protection Engineer shall determine the special needs and areas where training will be most valuable. The Owner and Engineer shall decide how rigorous the training should be for each piece of commissioned equipment. The Fire Protection Engineer shall communicate the results to the Subs and vendors who have training responsibilities.
  2. Each Sub and vendor responsible for training shall submit a written training plan to the Fire Protection Engineer for review and approval prior to training. The plan will cover the following elements:
    - a. Equipment (included in training)
    - b. Intended audience
    - c. Location of training
    - d. Objectives
    - e. Subjects covered (description, duration of discussion, special methods, etc.)
    - f. Duration of training on each subject
    - g. Instructor for each subject

- h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
      - i. Instructor and qualifications
  - 3. The General Contractor shall develop an overall training plan and shall coordinate and schedule, with the Subcontractors and other consultants, the overall training for the commissioned systems. The Engineer will recommend approval of the training to the Owner upon satisfactory completion using a standard approval form. The Owner and Contractors sign the approval form.
- C. Fire Protection Contractor. The Fire Protection Contractor shall have the following training responsibilities:
  - 1. Provide the Fire Protection Engineer and Owner with a training plan two weeks before the planned training.
  - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
  - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
  - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
  - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
  - 6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
  - 7. Training shall include:
    - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    - c. Discussion of relevant health and safety issues and concerns.
    - d. Discussion of warranties and guarantees.
    - e. Common troubleshooting problems and solutions.

- f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
  - g. Discussion of any peculiarities of equipment installation or operation.
  - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
8. Hands-on training shall include start-up, operation in all modes possible, including manual, start-up shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
  9. The Fire Protection contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls.
  10. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.
  11. Minimum Duration of Training. The Fire Protection contractor shall provide training on each piece of equipment according to the following schedule.

<u>Hours</u>	<u>System</u>
.5	Piping Systems
.5	Fire Protection System
.5	Fire Sprinklers

**END OF SECTION**

**SECTION 21 1000****MATERIALS AND METHODS – FIRE SUPPRESSION****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 21 0500 - "General Provisions – Fire Suppression" shall apply to and become part of this Section.

**PART 2 - MATERIALS:** Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.

**2.1 PIPE HANGERS:**

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.
- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor.
- G. Beam Clamps: Anvil Fig. 92.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers per NFPA 13.
- K. Space pipe hangers per NFPA 13.

**2.2 GAUGES:**

- A. Install 4-1/2" dial pressure gauges per NFPA 13. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Trerice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.

**PART 3 - EXECUTION****3.1 PIPE INSTALLATION:**

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- C. Install drains from low points and inspector's test in fire protection piping to approved points, whether shown or not.
- D. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- E. Lay underground fire protection piping so top of pipe is at least 30" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- F. Run no piping in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.
- G. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetrations Firestop Systems where included in the contract documents, Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation.
- H. The firestop systems provided shall resist the spread of fire, resist the passage of smoke and other gases.
- I. Provide U.L. classified through-penetration firestop system for each penetration in accordance with manufacturer's guidelines.

**END OF SECTION**

**SECTION 21 4000****FIRE SUPPRESSION****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 21 0500 - "General Provisions - Fire Suppression" and Section 21 1000 - "Materials and Methods - Fire Suppression" shall apply to and become part of this Section.
- B. It is the Contractor's responsibility to verify flow test data prior to ordering any equipment. If results do not meet demand, he is to notify the Architect prior to preparing shop drawings. If the test is more than one year old, the Contractor shall have the system retested.

**1.2 SHOP DRAWINGS:**

- A. Hydraulic calculations and sprinkler shop drawings for building fire protection systems must be prepared under the supervision of an engineer licensed in the State of (**Alabama**). Layout to show precise locations and elevations of sprinkler heads and piping with sizes indicated. Coordinate location of piping and sprinkler heads with other work, including piping, ducts, diffusers and lighting fixture layout. When submitted to Architect, drawings and calculations shall bear the stamps of approval from Owner's Underwriter and local Fire Marshal's office.
- B. Prepare shop drawings: (**Shop drawings, hydraulic calculations and material data may be submitted in PDF format electronically by e-mail**)
- C. State on drawings: Hose threads match the Local Fire Department Equipment.

**1.3 CODES:**

- A. Provide all equipment, piping, valves, fire and jockey pumps, switches and complete operating system to standard of NFPA 13 in compliance with local, county and state authorities, Owner's Underwriter, and these Specifications.

**1.4 SERVICE:**

- A. Coordinate with Civil and provide for connection at approximately 5 feet outside of building.

**1.5 HYDROSTATIC TESTING:**

- A. Fire protection piping tests: Test in accordance with NFPA 13 and 25. Architect, Owner's Underwriters and local Fire Marshal shall witness tests. Provide certificate of inspection to the Architect including the names of those witnessing the test.
- B. In addition to the standard hydrostatic test, all dry piped systems shall require an air pressure leakage test at 40 psi to be conducted for 24 hours. Any leakage that results in a loss of pressure shall be corrected prior to performing the hydrostatic test.

- C. On completion of installation test all piping and attached appurtenances subjected to system working pressure at 200 psi or 50 psi in excess of the system working pressure, whichever is greater, the system shall maintain that pressure for 2 hours. Pressure loss shall be determined by a drop in gauge pressure or visual leakage. The test pressure shall be read from one of the following, located at the lowest elevation of the system or the portion of the system being tested:
1. A gauge located at one of the hydrant outlets
  2. A gauge located at the lowest point where no hydrants are provided
- D. To reduce the possibility of serious water damage in case of a break, pressure can be maintained by a small pump, the main controlling gate meanwhile being kept shut during the test.
- E. Hydrostatic tests should be made before the joints are covered so that any leaks can be readily detected.
- F. The test procedure is as follows: Apply additional pressure, by temporary pump or compressed air connection. The water pressure is to be increased in 50 psi increments until the test pressure described above is attained. After each increase in pressure, observations are to be made of the stability of the joints. These observations are to include such items as protrusion or extrusion of the gasket, leakage, or other factors likely to affect the continued use of a pipe in service. During the test, the pressure is not to be increased to the next increment until the joint has become stable. This applies particularly to movement of the gasket. After the pressure has been increased to the required maximum value and held for 1 hour, the pressure is to be decreased to 0 psi while observations are made for leakage. The pressure is again to be slowly increased to the value specified above and held for 1 more hour while observations are made for leakage.
- G. Loss shall be determined by a drop in gauge pressure or visual leakage.
- H. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

**PART 2 - PRODUCTS** Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, and all other associated equipment.

**2.1 GENERAL:**

- A. Refer to Electrical Drawings and Specifications for alarms, wiring of supervisory switches and related equipment.

**2.2 FIRE PROTECTION PIPING:**

- A. System shall comply with NFPA 13.



- B. All fire protection piping within building: black steel. All underground fire protection piping outside building: ductile iron. All fire protection piping above ground on outside of building: galvanized. **Use of CPVC fire protection piping is not approved and must be pre-approved for use by the Owner in writing. Any CPVC fire protection piping installed without pre-approval in writing will be replaced with specified material at contractor's expense.**
- C. Black steel pipe: schedule 40, ASTM A-53, A-106 or A-135. Fittings on piping 2" and smaller black malleable iron or cast iron 175 lb., screwed ANSI B 16.4 or B 16.3; piping fittings 2-1/2" and larger, welded fittings, ANSI B 16.9 or Victaulic, Anvil or Gustin Bacon fittings for roll grooved pipe, ASTM A-47. Where allowed by NFPA 13 and Owner's Underwriter, schedule 10 black steel pipe with roll groove may be substituted.
- D. In Pre-Action and Dry Pipe System, steel pipe must be internally galvanized.
- E. Ductile iron pipe: cement lined, ANSI A 21.50.
- F. Joints on black steel screwed piping: Make up with Teflon tape applied to male threads.
- G. Joints on black steel welded piping: Comply with ANSI standard. B 16.9 and B 16.25.
- H. Joints on black steel grooved piping: Victaulic, Anvil or Gustin Bacon couplings, ASTM-A-47. Note: Victaulic #920 or #922 Mechanical T's are approved for use only where connections to existing systems are required. All joints must be cut or roll grooved.
- I. Joints on ductile iron piping: standard mechanical joint ANSI A21.11. Provide retainer glands on all fittings. Provide concrete thrust block, minimum 1 cubic yard, at all fittings. Thrust block must bear against virgin soil.
- J. Arrange for connection to existing water main, backflow preventer as required by local utility, service line from main to building as required by local utility. Pay all charges, fees, temporary deposits, etc.

### 2.3 PIPE HANGERS:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference.
- B. Pipe hangers for lines 8" and smaller: Anvil Fig. 69.
- C. Trapezes where required to bridge between structural members, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze.
- D. Provide riser clamps on pipe risers on each floor.
- E. Beam Clamps: Anvil Fig. 92.
- F. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- G. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- H. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe thru 3", 1/2" rods for 4", 5", 6" and 8", 5/8" rods for pipe 10" and larger.

- I. Pipe hanger spacing for screwed, cut or roll groove joint and welded piping in strict accord with NFPA 13. Install additional hangers at change of direction, valve clusters, and at ends of branch lines.

#### 2.4 FIRE PROTECTION VALVES:

- A. Gate valves 2" and smaller: all bronze, 175 psig WP, UL listed, OS&Y, solid disc, Stockham B-133, Nibco T-104-0, Milwaukee Valve BB-SC100.
- B. Gate valve 2 1/2" and larger: iron body, bronze trim, flanged, 175 psig WP, UL listed, OS&Y, Stockham G-634, American Darling 55, Kennedy 68, Mueller A2073-6, Nibco F-607-0.
- C. Butterfly Valves: Central Figure 570 or 580 complete with supervisory switch for indoor or waterproof on exterior UL/FM approved.
- D. Check valves: iron body, bronze trim, 175 psig WP, UL listed, Stockham G-939, American Flow Control 50-SC, Kennedy 126, Mueller A2120-6, Nibco F-908-B.

#### 2.5 SPRINKLER WATER FLOW INDICATOR AND SUPERVISORY SWITCHES:

- A. Underwriter approved paddle switch type water flow indicator, 120/1/60, two single pole, double throw contacts, one set for remote alarm, one set for alarm bell, complete with supervised cover on device. Automatic, Viking, or Anvil.
- B. Underwriter approved 6" electric bell, 120/1/60, or water motor alarm gong, paint exterior of bell as required by Architect.
- C. Supervisory switches, equal to Notifier Company Model NGV or SGV or Potter OSYSU-1 or -2 with NEMA 6P enclosure shall be used where subject to any condition where water is present, such as, in exterior vaults, complete with supervised cover on device. Potter waterproof switches must be used where installed outside building. All valves shall be supervised open. Provide with 2 sets of single pole double throw contacts.
- D. Verify location of any bells or alarms with Architect.

#### 2.6 SPRINKLER HEADS:

- A. Sprinkler heads shall be **(Quick Response)** commercial type, U.L. listed by Reliable, Victaulic, Tyco, Viking, Globe or approved equal. **Sprinkler heads shall be centered both directions in ceiling tile, located symmetrically in rooms and centered in corridors. Location of sprinklers to be approved by Architect.**
- B. Submit sample of any proposed equivalents in sprinklers prior to bid date. See Substitutions Section.
- C. Sprinklers subject to mechanical injury shall be protected with listed guards.

#### 2.7 SPARE SPRINKLERS:

- A. Provide sprinklers and all required items in cabinet per NFPA 13. Provide one sprinkler wrench for each type head.

**2.8 EQUIVALENT MANUFACTURERS:**

- A. Where Croker/Standard is listed above Potter/Roemer, Elkhart, Guardian or Sierra may be utilized.

**PART 3 - EXECUTION****3.1 PIPING:**

- A. Provide drain piping to approved locations for all low points. Provide inspectors test piping to the building exterior at approved locations. Provide splash blocks for all exterior drains. (All drain piping to be galvanized.)
- B. Install using tradesmen certified in sprinkler pipe and system installations.
- C. Fire protection piping may be factory cut to lengths, but field modifications will be required to coordinate with other trades.

**3.2 PERIODIC INSPECTION:**

- A. Make two periodic inspections within the first year after completion and acceptance of the work. Furnish a complete written report of each inspection to the Architect and the Underwriter.

**END OF SECTION**

**SECTION 22 0500****GENERAL PROVISIONS – PLUMBING****PART 1 – GENERAL****1.1 SCOPE:**

- A. Provisions of this Section apply to all Plumbing work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Plumbing work shown or specified, complete and ready for operation, consisting in general of the following:
  - 1. A system of sanitary drain, waste, and vent piping.
  - 2. A system of domestic water piping.
  - 3. A system of natural gas piping.
  - 4. Providing plumbing fixtures and equipment as shown on drawings.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Plumbing work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. "Provide" means to furnish and install, complete and ready for operation.

**1.2 DRAWINGS:**

- A. Plumbing Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Plumbing Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Plumbing drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work in proper manner.
- D. Contractor for Plumbing work is responsible for coordinating with all trades.

**1.3 APPLICABLE CODES AND STANDARDS:**

- A. Comply with the current editions of the following Codes and Standards:
1. ANSI/B31.9 - Code for Building Services Piping
  2. NFPA 54 - National Fuel Gas Code
  3. NFPA 70 - National Electrical Code
  4. NFPA 90A – Installation of Air Conditioning and Ventilating Systems
  5. NFPA 101 - Safety to Life from Fire in Buildings and Structures
  6. Other standards as referenced in other sections of Division 22
  7. 2021 International Building Code
  8. 2021 International Plumbing Code
  9. 2021 International Fuel Gas Code if no local code
  10. 2021 International Mechanical Code
  11. 2021 International Energy Conservation Code

**1.4 QUALIFICATIONS OF SUBCONTRACTOR:**

- A. The Plumbing Subcontractor shall meet the following minimum qualifications:
1. He shall have been in business as a Plumbing Contractor for at least 3 years prior to the date of opening bids.
  2. He shall have a current Master Plumber's Certificate of competency issued by the State of **Alabama** and the City and County in which work occurs.
  3. He shall have a satisfactory experience record with Plumbing installation of character and scope comparable with this project and shall have completed three such installations in the past three years.
  4. If the Plumbing Subcontractor, with the Engineer's approval, uses a Sub-Subcontractor to provide another discipline that the Subcontractor does not normally furnish, that Sub-Subcontractor shall meet the same qualifications as the Subcontractor.

**1.5 CONFLICTS AND INTERFERENCES:**

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

**1.6 WORKMANSHIP:**

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

**1.7 COOPERATION:**

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

**1.8 VISITING SITE:**

- A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

**1.9 MATERIALS:**

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted, all pipe, fittings and valves shall be made in the United States of America.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.

- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

#### **1.10 SHOP DRAWINGS:**

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of piping) and drawn to 1/4" to 1'-0" scale.
  - 1. Complete Plumbing equipment plans showing location of equipment, floor drains, and equipment pads and foundations.
  - 2. Equipment piping.
  - 3. Plumbing piping.
- B. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A signed agreement between the Engineer and Contractor shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files.

#### **1.11 RECORD DRAWINGS:**

- A. When work starts the Architect will furnish two complete sets of white prints of the Plumbing Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
  - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
  - 2. Block out areas modified by change-order & identify them by change-order number.
  - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.

- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions.

#### 1.12 PROTECTION OF EQUIPMENT:

- A. During construction, protect Plumbing equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.

#### 1.13 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. **Provide space at all equipment power and control panels as required by local codes.**
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
  - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
  - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

#### 1.14 EQUIPMENT SUPPORTS:

- A. Provide supports for piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.

#### 1.15 FLASHING:

- A. General: Furnish all pitch cups, metal base flashing and counter flashing required for Plumbing Work. Installation of above items is specified in Roofing Section.
- B. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- C. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.



- D. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".
- E. Vent Pipe and Roof Drain Flashing: Specified in "Roofing Section".
- F. Shower pans specified in another section. Securely clamp drain to pan under this section.

#### **1.16 EXCAVATION & BACKFILLING:**

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

#### **1.17 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:**

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

#### **1.18 SLEEVES:**

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.
- C. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetrations Firestop Systems where included in the contract documents, Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSTONE bearing UL listing for actual conditions of

installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.

- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (Plumbing rooms, toilets, etc.).
- F. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

#### **1.19 PAINTING:**

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section. Gas piping shall be painted yellow unless otherwise noted.
- D. Prime and paint all grillage, supports, etc. located indoors, except where noted to be galvanized.
- E. Other painting is specified in Painting Section, Finishes Division.

#### **1.20 PIPE IDENTIFICATION:**

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. (Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.) Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- C. Label Spacing and Extent:
  - 1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
  - 2. Wherever a pipe enters or leaves a room or building.
  - 3. At change of direction.
  - 4. At main valves and control valves (not equipment valves).
  - 5. At manifolds.

6. On risers, just above and below floors.
7. All natural gas piping in the 2 psig system: label at the beginning, at all gas cocks, at ends and at 6'-0" intervals with labels reading "2 psig".

**1.21 VALVE TAGS:**

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
  1. Plumbing: Black tags with white numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building.

**1.22 VALVE CHARTS:**

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.
- B. In existing buildings include existing valves in the charts of new valves.

**1.23 EQUIPMENT IDENTIFICATION:**

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Secure nameplates with acorn head screws.
- C. Colors:
  1. Equipment connected to utility power only - black letters on white nameplates.
  2. Equipment connected to emergency power - red letters on white nameplates.
- D. In existing building replace all existing nameplates which do not comply with above colors.

**1.24 ACCESS DOORS:**

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

**1.25 TESTS, CLEANING & ADJUSTMENTS:**

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation and correct all noise or vibration conditions. Perform all tests as required by local codes. Contractor shall furnish testing equipment. **All piping pressure tests shall be hydrostatic tests.**
- C. If local codes are more stringent than the following, local codes shall govern.
- D. Sanitary, and Rain Water Systems:
  - 1. Test piping by stopping lower outlets and filling with water to 10' hydrostatic head. Stop leaks and repeat test until watertight. All joints shall be exposed throughout test.
  - 2. Provide "Ball Test" on all piping 3" and larger with ball 1/2" smaller than pipe diameter.
- E. Domestic water piping: Test by applying pressure (by temporary pump or compressed air connection) to total hydrostatic pressure 1-1/2 times street pressure but not less than 150 psig for not less than 4 hours. Immediately and completely stop all leaks. On completion of roughing-in, cap all outlets, make connections with house supply line, and put under full water pressure. After testing, leave general pressure on until ready to install fixture (except when necessary to drain to avoid freezing during construction). After completion of all tests, repairs and installation of fixtures, flush all domestic hot and cold water piping with water to remove sediment and scale and then disinfect. Disinfect piping with hypochlorite solution of chlorine or compressed chlorine gas applied through an approved chlorinator. Operate valves and faucets several times to insure the chlorine reaches all parts of the system. Feed water and chlorination agent into the system at rates that will provide a residual chlorine content of not less than 50 ppm after a retention period of 6 hours. Upon completion of treatment, flush treated water from each system until the water supply is satisfactory to the public health authority having jurisdiction. Provide Architect a certificate of compliance from the local Health Department as required.

- F. Natural Gas Piping Tests: After all piping is roughed in but before connection to main or to appliances or equipment, test piping for tightness as required by local gas company; or in the absence of such requirements, apply in Architect's presence an air pressure test equal to 25 psig, which piping shall maintain without pressure drop for at least four hours. Stop all leaks shown up by such test and repeat test until piping is airtight. Black steel piping below grade shall be Holiday tested prior to backfilling.
- G. Shower Floor:
1. Test shower floors for tightness after membrane is installed and clamped to shower drain with 3" of water for 4 hours with no loss of water.
- H. Start-Up and Service:
1. The Contractor and factory authorized service representative for the water heaters shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period.
  2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.
  3. The Contractor shall balance all hot water pumps and circuit setters to flow shown on drawings. Balancing shall not be started until 1) Systems have been completed, including leak testing and cleaning and until systems have been refilled, pumps are rotating correctly, and strainers have been cleaned and baskets used for the ultimate installation have been installed, and 2) Expansion tanks have been installed and correct system pressure is being maintained, and system has been vented and is free from air.
    - a. Adjust circuit setters to meet design GPM requirements. Measure and record GPM.
    - b. Produce a report documenting the measured flows and submit three (3) copies of the report to the Architect.

#### **1.26 WARRANTY & INSTRUCTIONS:**

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- D. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.

- E. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

**1.27 PROJECT CLOSE-OUT:**

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
  - 1. Record drawings – plumbing: PDF files and CAD files.
  - 2. Equipment Submittal Data PDF files.
  - 3. Equipment operating and maintenance manuals PDF files.
  - 4. Maintenance schedule.
  - 5. Equipment warranty dates and guarantees.
  - 6. Pressure vessel certificates.
  - 7. Circulating hot water balance report.
  - 8. Certificate of disinfection of domestic water lines as required by local authority.
  - 9. List of Owner's Personnel who have received maintenance instructions.
  - 10. Install valve charts in Mechanical Rooms.
  - 11. Submit factory start-up reports for:
    - a. Water heaters
  - 12. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

**END OF SECTION**

**SECTION 22 1000****MATERIALS AND METHODS – PLUMBING****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 22 0500 - "General Provisions - Plumbing" shall apply to and become part of this Section.

**PART 2 - MATERIALS: (Unless otherwise noted, all pipe, fittings and valves shall be manufactured in the United States of America)**

**NOTE: All materials used in systems that may be used for potable water shall meet the Reduction of Lead in Drinking Water Act.**

**2.1 SANITARY, WASTE AND VENT PIPING:**

- A. Inside building to foundation wall: Vent piping smaller than 3": Cast iron or PVC-DWV plastic. Waste piping above floor 2" or smaller: Cast iron, DWV copper, or PVC-DWV plastic. Other waste and vent piping above slab on grade: Cast iron or PVC-DWV plastic. Piping below slab on grade: PVC-DWV plastic. Piping from discharge of equipment that will convey water at a temperature greater than 140°F shall be cast iron. Pipe exposed in mechanical rooms or housekeeping rooms shall be cast iron. Piping in return air plenums shall not be PVC.
- B. Outside building (from foundation wall to sewer provided under the Civil Section) 2'-0" or more below grade in non-traffic areas: PVC-DWV, or cast iron. Less than 2'-0" cover and in traffic areas: Cast iron or Ductile iron.
- C. Cast iron soil pipe: cast iron no-hub pipe and fittings, CISPI Standard 301, ASTM A888 shall be used only above slab on grade.
- D. Ductile iron pipe: Class 52, ASTM A746, ANSI/AWWA C151/A21.51 cement lined, fittings of corresponding weight, but not cement lined.
- E. DWV copper pipe: copper drainage tube DWV meeting ASTM B 306 with cast bronze solder joint drainage fittings, ANSI B-16-23.
- F. PVC-DWV plastic pipe: PVC-DWV, ASTM D-2665 shall not be used in ceiling plenum return. Solid core only permitted. Cell core not allowed. Provide PVC to cast iron adaptors below slab on grade for caulking or compression joint. No hub bands are not allowed. As an alternative provide coupling equal to Mission Heavyweight at the finish floor.
- G. Joints for no-hub cast iron piping: no-hub neoprene gasket and stainless steel coupling CISPI Standard 310 & ASTM C1277. Joints for 4" and larger shall be 4-band heavy-weight equal to Husky. No hub bands are not allowed below slab on grade.

- H. Joints in ductile iron pipe: push on joints applied as directed by manufacturer meeting ANSI/AWWA C111/A21.11 requirements.
- I. Joints for PVC-DWV plastic pipe: solvent welded cement, ASTM D-2564, made in accord with ASTM D-2855. Provide cast iron to PVC adaptors, for caulking or compression joint when connecting to a cast iron drain or when converting from cast iron to PVC.
- J. Install vent stacks through roof. Terminate 6" above finish roof or according to local code. Flashing is specified under Roofing Section.
- K. Connect to City sanitary sewer as required by local authority. Verify exact location and invert prior to installing any pipe.

## **2.2 DOMESTIC WATER PIPING:**

- A. Domestic Water piping within building: copper tube. Water piping outside building: copper tube.
- B. Copper tube, ASTM B-88, copper water tube, type "L" hard temper inside building, type "K" outside building. Fittings: wrought copper water tube fittings, ANSI B 16.18 or B 16.22.
- C. Joints on copper tube: soldered as recommended by manufacturer, using 95-5 solder. Lead free solder, flux, etc. is required. Mechanically formed tee fitting, as created by T-Drill, is an acceptable method of installation. All joints created in this manner shall be brazed in compliance with code and in accordance with manufacturer's recommendation. Soft solder joints are prohibited. Installation shall be performed by certified T-Drill crafts people.
- D. Provide temporary construction water at site as required.

## **2.3 NATURAL GAS PIPING:**

- A. All gas piping below grade: black steel or plastic pipe or tubing. All black steel gas piping below grade, mill- wrapped with fittings field-wrapped with PVC tape, same thickness as mill wrapping. Mill wrapping shall be X-TRU COAT. Ferrous piping shall be holiday tested prior to backfilling. All gas piping above grade: Black steel.
- B. Black steel pipe, schedule 40, ASTM A-53 or A-106. Fittings on pipe 2" and smaller, black malleable iron screwed fittings, ASTM A-197.
- C. Plastic pipe or tubing: Polyethylene pressure pipe and fittings conforming with ASTM D 2513. Note: May be used only below grade and cannot be used in or below any building. Transition to steel piping shall be by anode less transition fittings conforming to Category I of ASTM D 2513 and U.S. DOT 49CFR 192.281(e). (Use must be verified with Local Authority).
- D. Joints on black steel screwed pipe made up with Teflon tape applied to male threads only.
- E. Joints on black steel welded pipe made up with butt welding fittings. Mitering and notching for tees, etc., not permitted. Weldolets are permitted.
- F. Joints on plastic pipe made up with compression couplings or heat fusion joints as recommended by the manufacturer in complete accord with the local authority.
- G. Unions 2" and smaller, black malleable iron screwed.



- H. Arrange for tapping of utilities main, service from main to meter and installation as required by local utility. Pay all charges, fees, temporary deposits, etc. (Contractor is responsible to verify pressures, main and service extensions with the local utility prior to installing any new pipe).
- I. All gas piping in the 2 psig system, labeled at the beginning, at all gas cocks, at ends and at 6' intervals with labels reading "2 psig". See piping identification for materials.
- J. Appliance type regulators as shown on drawings. Regulators shall have vent limiting device as required by local code and local utility, or shall be vented to the exterior as approved by Architect.

#### **2.4 PLUMBING VALVES:**

- A. Supply water piping valves as specified. All valves shall meet the Reduction of Lead in Drinking Water Act.
  - 1. Ball valves: (2" and smaller) all bronze, 600 psig WOG, 150 psig WSP, stainless ball and stem, full port, Teflon seats, stem packing seal and thrust washer. Nibco T585-66-LF or S-585-66-LF, Watts, Apollo, Milwaukee or Josam. Provide extension stem capable of clearing 2" insulation, with memory stop, when operated will not disturb vapor seal of insulation.
  - 2. Check valves 2" and smaller: All bronze, 125 psig WSP, swing check, Nibco S-413-Y-LF, Milwaukee or Watts.
  - 3. Water pressure reducing valves: For low flow Watts LFU5B or Wilkins, Conbraco or Cash Acme, complete with inlet strainer, unions and inlet and outlet pressure gauges.
  - 4. Calibrated balancing valves ("Circuit Setter"): 125 psig WP, 2" and smaller bronze, screwed; 2-1/2" and larger IBBM, flanged plug valves. All with indicator for angular position of valve, meter connections with positive shut-off valves and internal seals to prevent leakage around stem. Valves should have a locking device to prevent opening past preset position. For each valve provide a flow vs. differential pressure vs. angular position calibration chart and pre-formed foam insulation suitable for temperatures from 35 to 250F. Nibco 1810LF (small) or 737 (large), Armstrong, B&G, Taco or equal.
- B. Natural gas valves: Plug cocks – 2-1/2" and larger, Resun R-1431, AGA seal of approval, 175 psi; 2" and smaller, Milwaukee BB2-100, Nibco FP-600, Conbraco GB-10/11, GB-50 series, or Resun R-1430 with CSA seal of approval, 175 psi.

#### **2.5 PIPE HANGERS:**

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.

- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.
- G. Beam Clamps: Anvil Fig. 228.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8", 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- K. Support plumbing water, medical gas and vacuum piping within stud partitions with brackets as manufactured by P&M Bracket Company, Sumner Products, B-Line Ruff-in or Holdrite. Wire is expressly prohibited. Support horizontal plumbing soil and waste piping within stud partitions with Unistrut anchored to floor. Provide fire treated wood backing where required to anchor fixtures and brass securely.
- L. Space pipe hangers at maximum: 5' intervals for cast iron pipe. Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction and valve clusters.
- M. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering. (At Contractor's option, pipe shields may be field fabricated using rigid calcium silicate or foamglass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".)

## **2.6 THERMOMETERS AND GAUGES:**

- A. Non-mercury in glass blue reading separable socket industrial thermometers with die cast aluminum or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice or Weksler. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or stems long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.

- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Trerice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.
- E. Where shown, provide temperature and pressure measurement plugs and caps equal to Peterson Equipment Co., Inc. "Pete's plug with Nordel seats and seals". Provide one Pressure and Temperature Kit consisting of a 0-100 psi pressure gauge with adaptors, and two thermometers (25-125°F and 0-220°F), all in carrying cases. Provide nipples for Pete's plugs as required to extend through pipe insulation.

### **PART 3 - EXECUTION**

#### **3.1 PIPE INSTALLATION:**

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Slope Sanitary Drain Lines:
  - 1. Grease lines: minimum 1/4" per 1'.
  - 2. 3" and larger: minimum 1/8" per 1'.
  - 3. Less than 3": minimum 1/4" per 1'.
- C. Install piping to allow for expansion. Make connections to plumbing fixtures and all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- D. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- E. Make horizontal water line size reductions using eccentric reducers (tops flat).
- F. Install 3/4" ball valve drains with hose adaptors at low points of water piping and at bases of all risers (where shown provide larger drains). Provide screwed caps with chains on hose adaptors.
- G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.

- I. Near heating and air conditioning equipment requiring water provide valved and capped water outlets of sizes shown for connection to equipment, including reduced pressure principal backflow preventers. Make final connections under HVAC work. **Note that all piping and insulation downstream from backflow preventer must be painted yellow.**
- J. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- K. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- L. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- M. Lay out and grade all gas piping so as to have a minimum of trapped lines. Where trapping of pipe is unavoidable, provide 4" to 6" scale pocket at low point, with removable cap fitting accessible for cleaning out pocket. Install 175 psig WP bronze cock and union at all connections to gas-fired equipment.
- N. Install no gas piping beneath interior slabs on grade. Where gas piping must be installed below slab on grade, pipe must be encased in steel pipe sealed and vented to exterior as shown on detail.
- O. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.
- P. Provide water hammer arrestors equal to Wilkins WH2950XL. Refer to drawings for location and P.D.I. size. Shock arrestors are required on all equipment with solenoid shutoff valves such as washing machines and dishwashers whether shown or not. Select WH2950XL for use with fixtures which may supply drinking water. Equal by Josam, J.R. Smith, Wade, or Sioux Chief is acceptable.
- Q. All water piping shall be installed within the heated envelope of the building, or otherwise protected from freezing.

### 3.2 INSTALLATION OF VALVES:

- A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Provide check valve in discharge line adjacent to each pump.
- C. Locate valves in piping connections to heat exchangers, water heaters, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- D. Provide sweat to screw adaptors where required.
- E. Install with valve stems upright or horizontal.

**END OF SECTION**

**SECTION 22 1500****THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS****PART 1 - GENERAL****1.0 GENERAL:**

- A. All insulation shall be installed by an insulation contractor in business a minimum of 3 years as an insulation contractor and has completed projects similar in scope to this project.

**1.1 SCOPE:**

- A. Section 22 0500 - "General Provisions – Plumbing" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. (Items which are not "exposed" are considered "concealed".)
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

**1.2 INSULATION:**

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 22 1000 - "Materials and Methods - Plumbing."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
  - 1. 50 for pipe covering located in air ducts, plenum or casings.
  - 2. 150 for all other pipe and equipment insulation.

**PART 2 - MATERIALS****2.1 FIBERGLASS PIPE COVERING:**

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ). For domestic hot water circulating system, thermal conductivity shall be 0.27 BTU/(h)(sq.ft.)(°F/in.) at 75°F mean temperature.
- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

**2.2 FOAMED PLASTIC PIPE COVERING: (DO NOT USE IN PLENUMS UNLESS COMPLIES WITH PARAGRAPH 1.2 ABOVE):**

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in).
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction.
- E. Fit pipe hangers over insulation (see PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Where exposed outside, cover insulation with aluminum jacket.
- G. Armacell, Aeroflex or Normaco.

**PART 3 - INSTALLATION****3.1 PLUMBING PIPING:**

- A. Bodies of floor drains and floor sinks serving refrigeration equipment, AC units and ice machines and traps and waste piping between such drains and waste stack: "Foamed plastic pipe covering", 1" thick.
- B. Cold water piping, interior, above grade: "Fiberglass pipe covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick when needed for tight spaces.
- C. Hot water piping, interior, above grade: "Fiberglass pipe covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick when needed for tight spaces. All piping in recirculating system shall have 1" thick insulation for up to 1-1/4" pipe, and 1-1/2" thick insulation for 1-1/2" and larger pipe.

**END OF SECTION**

**SECTION 22 2000****PLUMBING FIXTURES AND EQUIPMENT****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 22 0500 - "General Provisions - Plumbing" and Section 221000 - "Materials and Methods - Plumbing" shall apply to and become part of this Section.

**PART 2 - PRODUCTS****2.1 DRAINS:**

- A. Mechanical Room Floor Drains (MFD): J.R. Smith 2330 with sediment bucket, deep seal trap, and trap primer connection where shown or required.
- B. Floor and shower drain (FD)(SD): J.R. Smith 2005A with 6" nickel bronze grate. Select square top for tile floors. Provide primer connection where shown. Provide Trap Guard trap protectors where not shown. Provide deep seal trap on all floor drains.
- C. Floor Sink (FS): J.R. Smith 3418, 8" diameter, 6" deep porcelain enameled cast iron interior with full three quarter cast iron porcelain enameled grate and dome bottom strainer.
- D. Trench Drain (TD): KlassikDrain by ACO Drain K100 galvanized steel edge rail channel system. Drain body is polyester polymer concrete, nominal 4" clear opening, 4" side outlet. Cast in concrete with anchoring keys. Grate: Type 438D/437D longitudinal galvanized steel, load class B.

**2.2 TRAP PRIMER:**

- A. Trap Primer: Precision Plumbing Products Model P-2 with distribution unit(s) as required.
- B. Electronic Trap Primer (ETP): Precision Plumbing Products Model PT electronic with access door where multiple drains are served.

**2.3 WALL HYDRANT:**

- A. J.R. Smith 5509-QT or Prier C-634, with integral backflow preventer, latching cover, freeze-proof and of proper length for wall in which installed, verify with Architect finish of stainless steel, polished bronze, nickel bronze or rough bronze box face. Valve must be on building side of exterior wall insulation. Install with center line 24" above finish grade. Provide Owner with one loose key for each wall hydrant. For existing or pre-cast exterior walls use J.R. Smith 5609-QT.



**2.4 HOSE BIBB:**

- A. T&S B-0736-P0L, chrome-plated with removable tee handle in finished areas, and Model No. B-0736-RGH rough bronze in unfinished areas complete with vacuum breaker. Provide to Owner one loose key for each loose key hose bibb.

**2.5 CLEANOUTS:**

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angles, upper terminals and not over 50' apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk rectangular tapered slotted plugs. PVC or acid waste piping cleanouts shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, 8" and less.
- B. Exposed Cleanouts: Cast brass plug type, J.R. Smith 4470T.
- C. Wall type cleanout plug and access covers, J.R. Smith 4472T. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic waste pipe in wall: Cleanout access cover J.R. Smith 4710.
- D. Floor type cleanout access covers in unfinished areas: J.R. Smith 4239L/LXH-NB. Finished areas: J.R. Smith 4111L/LXH-NB. Plug must be within 3" of finished floor. Provide 4193L/LXH-NB covers where installed in terrazzo floors. Grout cleanout below access cover to seal watertight. Provide option 14 cleanout carpet markers where installed in carpeted floors.
- E. **Coordinate the exact location of all cleanouts with the Architect.**

**2.6 REDUCED PRESSURE ZONE BACKFLOW PREVENTER (RZBP) & DOUBLE CHECK VALVE ASSEMBLIES:**

- A. RZBP 1/2" thru 3" inch: equal to Watts LF009QT with ball valves and inlet strainer, Clayton, Beeco, Febco, Conbraco or Wilkins to meet ASSE 1013. Same size as piping.
- B. Pipe relief from RZBP to nearest floor drain or approved by the Architect.
- C. Double check valve assemblies: equal to Watts 1/2" thru 3"; 007QT, 4" thru 10"; 709. Clayton, Wilkins, Febco or Beeco, to meet ASSE 1015.
- D. All backflow preventers shall be checked and certified, in writing, after installation. Certifier must show proof of proper schooling in testing backflow preventer.

**2.7 PLUMBING FIXTURES:**

- A. Unless otherwise specified, all fixtures complete as catalogued, white color, exposed metal trim chromium plated. Fixtures shall be without discoloration, chips or flaws and shall be free from cracks. Warped or otherwise imperfect fixtures will not be acceptable.
- B. Clean all fixtures to a clean and sanitary condition.

- C. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lag bolts, as recommended by the manufacturer. Do not conceal until Architect has observed anchors.
- D. Flush valve supports equal to Sloan "YJ" shall be installed 1" below vacuum breaker, on all flush valves. Flush valves on A.D.A. water closets must be set so that handle is to the wide side of the stall and handle is no more than 44" above finish floor.
- E. Seal wall hung fixtures at wall with white caulk. Seal countertop fixtures with clear silicone sealant. Seal floor mounted fixtures at floor with grout.
- F. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall. Elevation of flush valves shall be coordinated with grab bars (see Architect). All shower control valves for ADA showers shall be set with centerline 44" above finish floor.
- G. All supplies, stops, faucets, etc. on fixtures that could be used for drinking water shall meet the Reduction of Lead in Drinking Water Act.
- H. Contractor shall coordinate all sinks and faucets with casework/millwork shop drawings prior to purchase of sink/faucet. In particular, coordinate A.D.A. vs. non-A.D.A. fixtures with casework/millwork. Failure to do so will make contractor liable for incorrect fixtures.

All items complete as catalogued as follows:

**WC-1 Water Closet (Flush valve, floor mounted, 1.60 gpf, manual):** Kohler K-96053, Sloan Regal 111 flush valve complete with "YJ" pipe support and Church 295 NSSC white open front seat.

**WC-2 Water Closet:** Kohler K-96057, 16-1/2" floor to rim, to meet A.D.A., Sloan Regal 111 flush valve complete with "YJ" pipe support and Church 295 NSSC white open front seat. Install flush valve with handle on wide side of stall or room. Must meet A.D.A.

**LAV-1 Lavatory:** Kohler K-2210, under counter mounted with clips for mounting, McGuire LF165 supplies with stops, 8872 P-trap, 155A strainer and tailpiece, Zurn Z810 single handle faucet, 0.5 gpm. Refer to Architect's drawings for mounting heights. Include ASSE 1070 point of use mixing valve equal to Wilkins ZW3870T for public lavatories.

**LAV-2 Lavatory:** Kohler K-2006, wall hung, McGuire LF165 supplies with stops, 8872 P-trap, 155A strainer and tailpiece. Zurn Z810 single handle faucet, 0.5 gpm. Provide J.R. Smith 700 or 700D carrier and set with rim 31" A.F.F. Include ASSE 1070 point of use mixing valve equal to Wilkins ZW3870T for public lavatories. Provide trap wrap for exposed p-trap, supplies and stops.

**SK-1 Sink:** Elkay ECTSRAD332260, dual mount, 18-gauge stainless steel with LK-35 waste strainer and tailpiece, McGuire LF165 supplies with stops and 8912 P-trap, Kohler Simplice K-596 pull down faucet.

**SK-2 Sink:** Elkay DLR252210, 25" X 22", 18-gauge stainless steel, drop in, with LK-35 waste strainer and tailpiece, McGuire LF165 supplies with stops and 8912 P-trap, T&S B-0220-166X-CRK double pantry faucet, lever handles, deck mounted, 2.2 gpm, non-aerated.

**SK-3 Sink:** Elkay LR-1918, 18 gauge, Type 304 stainless steel with LK-35 waste strainer and tailpiece, McGuire LF165 supplies with stops and 8912 P-trap, T&S B-2865-4 faucet modified with laminar flow gooseneck and no aerator, and 1.5 GPM flow rate.

**SH-1 Shower:** Freedom Showers APFXST6232LDCOL, applied acrylic, smooth tile finish, 66" x 32", center front drain, include seat, grab bars, soap drains, and plumbing fixtures. Must meet A.D.A.

**SH-2 Shower:** Shower compartment by G.C. Symmons 1-117-FS-X-V pressure balanced shower valve, complete with integral stops, 4-231 shower head, 4-458 diverter, in line vacuum breaker, hand spray unit with Deluxe head, 5'-0" long chrome plated hose, wall hook, wall connection and flange. Set wall control and diverter with centerline 44" A.F.F., hand held head 50" A.F.F. and fixed head 78" A.F.F. Must meet A.D.A.

**JR-1 Janitor's Receptor:** Stern Williams MTB-2424, 24" x 24" x 10" deep pre-cast terrazzo with aluminum guards on exposed sides and silicone sealant at walls. Provide splash catcher panels on adjacent walls. Provide T&S B-667-RGH faucet with spring checks. Set 42" above finish floor complete with heavy-duty hose.

**EWC-1 Electric Water Cooler:** Elkay LZSTL8WSSK bi-level water cooler with bottle filler and filter. All stainless steel, J.R. Smith Carrier, McGuire LF165 supply with stop and 8872 P-trap.

## 2.8 PLUMBING EQUIPMENT:

- A. **IWH-1, -2 and -3 Gas Tankless Water Heater:** Navien NPE-S2 condensing tankless water heaters. Include acid neutralization option. Install per detail.
- B. **CP-1 Circulating Pump:** B&G PL all bronze.

## 2.9 EQUIVALENT MANUFACTURERS:

- A. Where Kohler fixtures are listed above, Zurn, American Standard, or Toto may be utilized.
- B. Where Sloan flush valves are listed above, Zurn or Delaney may be utilized.
- C. Where Smith is listed above, Josam, Watts, Zurn or Wade may be utilized.
- D. Where Elkay water coolers are mentioned above, Halsey Taylor, Sunroc, or Oasis may be utilized.
- E. Where B&G is listed above, the equal of Armstrong, Taco, or Thrush may be utilized.
- F. Where Elkay sinks are listed above, Just may be utilized.
- G. Where Church water closet seats are listed above, Zurn, Beneke, Bemis, Centoco or Olsonite may be utilized.
- H. Where T&S Brass is listed above, Chicago Brass, Cambridge or Zurn may be utilized.
- I. Where Zurn faucets are listed above, Kohler, Delta, Moen, or Elkay may be utilized.
- J. Where Stern Williams is listed above, Fiat, or Zurn may be utilized.

- K. Where McGuire is listed above, the equal of Zurn, Watts, Dearborn or Brasscraft may be utilized.
- L. Where Navien is listed, Bosch may be utilized.
- M. Where Guardian is listed, Haws or Acorn may be utilized.
- N. Where Symmons is listed above, Zurn or Powers may be used.
- O. Where Striem is listed, equal by prior approval only.

**PART 3 - EXECUTION:**

**3.1 MANUFACTURER'S INSTRUCTIONS:**

- A. Install all plumbing equipment and fixtures as recommended by the manufacturer's recommendations.

**END OF SECTION**

**SECTION 23 0500****GENERAL PROVISIONS – HVAC****PART 1 – GENERAL****1.1 SCOPE:**

- A. Provisions of this Section apply to all Heating, Ventilating, and Air Conditioning (HVAC), Controls, and Test and Balance work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, complete and ready for operation, consisting in general of the following:
  - 1. System of toilet exhaust.
  - 2. 100% OSA split system.
  - 3. VRF System.
  - 4. Safe Room (Tornado Shelter) Ventilation.
  - 5. Central Control System.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. "Provide" means to furnish and install, complete and ready for operation.

**1.2 DRAWINGS:**

- A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.
- D. DO NOT scale drawings to locate ceiling diffusers. COORDINATE with lighting and ceiling grids. Contractor for HVAC work is responsible for coordinating with all trades.

- E. Drawings and specifications are complementary. Work shown or specified in one is binding as if shown or specified in both. Any discrepancies between the drawings and specifications shall be brought to the attention of the Consultant for clarification during the bidding period. No allowance shall be subsequently made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Consultant during the bidding period or by reason of any error on the Contractor's part.
- F. No attempt has been made to establish the required sections or splits of equipment relative to the size of access into the space, building, etc. Contractor shall establish all said splits, sections, etc. necessary to install equipment complete without undue disassembly of equipment or demolition of building parts at site of work.

### 1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
  - 1. ANSI/B31.9 - Code for Building Services Piping
  - 2. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration
  - 3. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality
  - 4. ASHRAE 90.1 – Energy Compliance
  - 5. NFPA 54 - National Fuel Gas Code
  - 6. NFPA 70 - National Electrical Code
  - 7. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
  - 8. NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations
  - 9. NFPA 101 - Safety to Life from Fire in Buildings and Structures
  - 10. Other standards as referenced in other sections of Division 23
  - 11. 2021 International Building Code
  - 12. 2021 International Plumbing Code
  - 13. 2021 International Fuel Gas Code
  - 14. 2021 International Mechanical Code
  - 15. 2021 International Energy Conservation Code

### 1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The HVAC Subcontractor shall meet the following qualifications:
  - 1. He shall have been in business as a HVAC contractor for at least 3 years prior to the date of opening bids, and shall have held a license from the **Alabama** State Licensing Board for General Contractors for at least 3 years.

2. He shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project, and for at least 3 years prior to the date of opening bids shall have had an established service department capable of providing service inspection or full maintenance contracts.
3. If the HVAC subcontractor, with the Engineer's approval, uses a sub-subcontractor to provide another discipline that the subcontractor does not normally furnish, that sub-subcontractor shall meet the same qualifications as the subcontractor.

#### 1.5 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

#### 1.6 WORKMANSHIP:

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

#### 1.7 COOPERATION:

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

#### 1.8 VISITING SITE:

- A. Visit site and become familiar with location and various conditions affecting work prior to bid. No additional allowance will be granted because of lack of knowledge of such conditions. No consideration shall be given to future claims due to existing conditions. Any discrepancies or interferences shall be reported immediately to the Architect/Consultant.

#### 1.9 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted, all pipe, fittings and valves shall be made in the United States of America.**
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials,

equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.

- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. Similar items of equipment shall be the product of the same manufacturer.

#### 1.10 SHOP DRAWINGS:

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn to 1/4" to 1'-0" scale.

Submit a minimum of 2 sets of bond shop drawings and PDF format digital files of shop drawings. Piping shop drawings shall include drain and vent locations, pipe slopes down to drains and up to vents, piping elevations, piping connection details, and a list of piping materials. Ductwork shop drawings shall include elevations, construction methods, reinforcements, gauges, and access door locations and sizes. Provide section drawings of locations where ducts cross or demonstrate with elevations that ducts will fit. All shop drawings shall be produced using AutoCad and a copy of the shop drawing files shall be provided in PDF format for shop drawing review. A CD-ROM with a copy of all approved shop drawings in CAD and PDF format shall be provided for project closeout. Shop drawings shall be received within 60 days of the execution of the contract and before consideration of a request for payment.

- 1. Ductwork (do not scale for diffuser locations, but coordinate with ceiling grids and lighting layout). See Section "Air Distribution". Shop drawings shall include material type (stainless steel, galvanized), finish (paint grip, etc.), actual sizes increased to allow for internal insulation and gauges along with fabrication section notes for individual sections. In addition, include elevations of bottom of duct above finished floor level. Show building sections through congested areas for coordination with structure and other disciplines. Provide joint details, duct seal methods, insulation type, etc.
  - 2. Equipment piping.
- B. Submit complete control and power wiring diagrams for approval before installing controls. See Controls Section.



- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A signed agreement between the Engineer and Contractor shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files.

#### **1.11 RECORD DRAWINGS:**

- A. When work starts the Architect will furnish two complete sets of white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
  - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
  - 2. Block out areas modified by change-order & identify them by change-order number.
  - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A signed agreement between the Engineer and Contractor shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files.
- D. Ductwork and Control Drawings (may be CAD files or a PDF shop drawings), up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.
- E. HVAC piping drawings may be prepared as noted above, or HVAC piping may be added to the ductwork shop drawings noted above.

#### **1.12 PROTECTION OF ROTATING PARTS:**

- A. For this paragraph only, "exposed" shall mean located in a casing or room or plenum with door large enough to admit a man.
- B. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.
- C. Equip propeller fan wheels with wheel guards.
- D. Equip inlets and outlets of exposed centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.
- E. Equip all exposed plug fans with wheel screens.

**1.13 PROTECTION OF EQUIPMENT:**

- A. During construction, protect HVAC equipment and ductwork from damage or deterioration and prevent water, dust, etc. from entering the equipment or ductwork. Cover ends of ductwork before delivery to site with Duro-Dyne Dyn-O-Wrap. Cover all openings in equipment with Dyn-O-Wrap until ductwork is attached.
- B. During construction, keep all stored ductwork securely covered for protection from water and dust. Do not store directly on the floor. Immediately remove all ductwork that is wet or dirty from the job site.
- C. During construction, seal joints and seams in ductwork as it is installed.
- D. When installation is complete, clean equipment and make ready for painting.

**1.14 INSTALLATION OF EQUIPMENT:**

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. Provide space at all equipment power and control panels as required by local codes.
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
  - 1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
  - 2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
  - 3. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.
  - 4. Air devices connected by flexible duct shall be secured independently of all other building systems to prevent falling if grid shifts.

**1.15 EQUIPMENT SUPPORTS:**

- A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.

- B. Set floor-mounted equipment on concrete pads of height shown, but not less than 3-1/2" high. Chamfer pads 1". Provide pads as follows:
  - 1. 6-inch pad for indoor air handler.
  - 2. 4-inch pad for outdoor units on grade.
- C. Provide factory fabricated equipment roof supports with tops 16" above roof line for roof mounted items as shown. Supports shall have integral cants, pressure treated wood nailers, and counter flashing. Supports shall be galvanized steel, gauge as required for loads, 18 gauge minimum.

#### **1.16 CUTTING AND PATCHING AND INCIDENTAL WORK:**

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the HVAC systems. Wiring of motors, switches and starters is included in "Electrical Sections".
- D. Do all control wiring required for HVAC work and all power wiring required by Control Panels, Control System, and Control Devices.
- E. Furnish motor starters as specified below.
- F. Final water connections to services are included in this Section.
- G. Permanent drain connections from AC units, etc., and auto air vents to nearest floor drain are included in this Section.
- H. Door louvers are not included in this Section.

#### **1.17 FLASHING:**

- A. General: Furnish all fan curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in Roofing Section.
- B. Fan curbs for power roof ventilators are specified with the fans.
- C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- D. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.

- E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

#### **1.18 EXCAVATION & BACKFILLING:**

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

#### **1.19 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:**

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.
- D. Motors: 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower motors shall meet NEMA premium efficiency levels as stated in the latest version of NEMA MG-1. Allis-Chalmers, General Electric, Goulds, Louis Allis, Westinghouse.
- E. Where motors are shown or scheduled to be connected to a variable frequency drive, this motor shall be an inverter duty rated by the motor manufacturer and shall comply with NEMA MG1, Article 31.
- F. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.
- G. Furnishing all starters is included in this Section. Starter installation is specified under "Electrical Section". Starters shall be equipped with melting alloy thermal overload and phase loss protection, in all 3 phases.
- H. Starters for the following items are specified with the equipment:
  - 1. Indoor AC units.

2. Outdoor condensing units.
  3. Outdoor heat pumps.
- I. Unless otherwise shown or specified for single phase motors provide manual starters equal to Square D Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.
  - J. Provide fused or circuit breaker combination magnetic line voltage starters with NEMA 1 enclosures with melting alloy overload and phase loss protection for exhaust fans where noted.
  - K. Provide H-O-A switches, fused control circuit transformers, auxiliary contacts, etc., as shown on control diagrams or required by control sequences.
  - L. All starters shall be the product of the same manufacturer.
  - M. All control panels, electrical assemblies, etc. must bear a label from a recognized testing laboratory as an assembly, not as individual components.

#### **1.20 SLEEVES:**

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.
- C. For pipe passing through floors outside fire rated chases and fire rated walls and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Through-Penetration Firestop Systems where included in the contract documents. Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Sleeves for ducts: see fire dampers (Section: Air Distribution).
- F. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (mechanical rooms, toilets, etc.).
- G. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.

- H. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

#### **1.21 PAINTING:**

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Paint un-insulated duct surfaces visible through grilles and registers flat black.
- D. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section.
- E. Prime and paint all grillage, supports, etc. located indoors except where noted to be galvanized.
- F. Other painting is specified in Painting Section, Finishes Division.

#### **1.22 PIPE IDENTIFICATION:**

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. (Markers on lines 8" OD and smaller shall be taped in place.) Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- C. Label Spacing and Extent:
  - 1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
  - 2. Wherever a pipe enters or leaves a room or building.
  - 3. At change of direction.
  - 4. At main valves and control valves (not equipment valves).
  - 5. At manifolds.

#### **1.23 VALVE TAGS:**

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
  - 1. HVAC: White tags with black numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).

- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

#### **1.24 VALVE CHARTS:**

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.

#### **1.25 EQUIPMENT IDENTIFICATION:**

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under Division 23.
- C. Secure nameplates with acorn head screws.
- D. Colors:
  - 1. Equipment connected to utility power only - black letters on white nameplates.
  - 2. Equipment connected to emergency power - red letters on white nameplates.

#### **1.26 EXHAUST FAN IDENTIFICATION:**

- A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fan, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

#### **1.27 ACCESS DOORS:**

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

**1.28 TESTS, CLEANING & ADJUSTMENTS:**

## A. General:

1. All tests shall be witnessed by the Architect in addition to the authorities having jurisdiction. A minimum of 72 hours notice is required prior to performance of tests.
2. All air duct pressure tests are specified in Section Air Distribution.
3. All HVAC air balance work and HVAC equipment tests (other than hydrostatic tests) are specified in section 237000, "HVAC Testing & Balancing". Notify the Testing and Balancing Agency when systems are ready for balancing - see Section 237000, "HVAC Testing & Balancing".
4. Testing and Balancing other than that noted above is specified in Section "HVAC Testing & Balancing".
5. All instruments used for testing and balancing work shall have been calibrated within 6 months and checked for accuracy prior to start of work.
6. Cooperate in the execution of work specified in Section 237000 HVAC Testing and Balancing and provide assistance as noted in Section 237000.
7. Perform all tests as required by local codes. Contractor shall furnish testing equipment.
8. If local codes are more stringent than the following, local codes shall govern.

## B. Air System:

1. Duct Cleaning:
  - a. Clean new duct system(s) before testing, adjusting, and balancing.
  - b. Use service openings for entry and inspection.
    - 1) Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation as recommended by insulation manufacturer. Comply with Section 236000 "Air Distribution" for access panels and doors.
    - 2) Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
    - 3) Remove and reinstall ceiling to gain access during the cleaning process.
  - c. Particulate Collection and Odor Control:
    - 1) When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.



- 2) When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- d. Clean the following components by removing surface contaminants and deposits:
- 1) Air outlets and inlets (registers, grilles, and diffusers).
  - 2) Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3) Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4) Coils and related components.
  - 5) Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  - 6) Supply-air ducts, dampers, actuators, and turning vanes.
  - 7) Dedicated exhaust and ventilation components and makeup air systems.
- e. Mechanical Cleaning Methodology:
- 1) Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  - 2) Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  - 3) Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  - 4) Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
  - 5) Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
  - 6) Provide drainage and cleanup for wash-down procedures.
  - 7) Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

2. When system has been completed, remove all trash and dirt, leave all balancing dampers open and install specified filters in all equipment. Check all fan motors for rotation. Provide all items as required for work specified in Section 237000 "HVAC Testing & Balancing".
- C. At the beginning of the first heating season, adjust and balance operating phases and repeat at the beginning of the first cooling season or vice-versa, as the case may be, all without charge.
- D. Start-Up and Service:
1. The Contractor and factory authorized service representative for the boilers, variable frequency drives, and chillers shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services do not include lubricating fans or motors and does not include changing filters or adjusting belts.
  2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.

#### 1.29 WARRANTY & INSTRUCTIONS:

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. All reciprocating and scroll refrigeration compressors shall bear 5-year non-pro-rated parts warranty.
- D. All gas fired air furnaces shall bear 10 year prorated heat exchanger warranties.
- E. After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.
- F. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- G. Any work performed on new or existing air conditioning/refrigeration equipment, whether inside or out, that requires removing the refrigerant from the system will require the use of a recovery/recycling unit. Intentional release of the refrigerant, regardless of type, will not be allowed.
- H. Any refrigerant removed from a system that has been properly recycled and has not been exposed to "burn out" can and should be reused in the system. Refrigerant that has been contaminated and cannot be reused after being properly recycled shall be reclaimed by the contractor and returned to the proper company representative.

- I. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- J. Supply initial charges of refrigerant, refrigeration lubricating oil and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.
- K. Make available to the Owner, without additional cost, warranty service and adjustment of the equipment for the guarantee period. Due to critical temperature guidelines Contractor shall respond to Owner's call for service within a 6 hour time period.

### **1.30 PROJECT CLOSE-OUT:**

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
  - 1. A letter signed by the subcontractors for HVAC, electrical, temperature control work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired and that controls and power circuits will function properly.
  - 2. Record drawings - sheet metal work: PDF files and CAD files.
  - 3. Record drawings – piping: PDF files and CAD files.
  - 4. Record drawings - control systems: PDF files and CAD files.
  - 5. Air balance report PDF files. (See Section 237000 "HVAC Testing & Balancing").
  - 6. Equipment Submittal Data PDF files.
  - 7. Equipment operating and maintenance manuals PDF files.
  - 8. Maintenance schedule.
  - 9. Equipment warranty dates and guarantees.
  - 10. List of Owner's Personnel who have received maintenance instructions.
  - 11. Install valve charts in Mechanical Rooms.
  - 12. Letter certifying and signed by Owner or his representative that the Owner or his representative has received the spare filters specified for each HVAC system.
  - 13. Submit factory start-up reports for:
    - a. VRF Systems
    - b. DOAS System
  - 14. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

**END OF SECTION**

**SECTION 23 1000****MATERIALS AND METHODS – HVAC****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 23 0500 - "General Provisions - HVAC" shall apply to and become part of this Section.

**PART 2 - MATERIALS: (All pipe, fittings and valves shall be manufactured in the United States of America)****2.1 HVAC DRAIN PIPING:**

- A. Standard weight galvanized steel pipe ASTM A106 with galvanized malleable iron fittings, or type L hard copper with wrought copper sweat fittings, at Contractor's option.
- B. Provide drain traps for AC unit drain pans. Size traps as required to drain under operating conditions. See trap detail on drawings.

**2.2 PIPE HANGERS:**

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- E. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.
- F. Beam Clamps: Anvil Fig. 228.
- G. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- H. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).

- I. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe.
- J. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction, valve clusters, and at all duct and unit mounted coils.
- K. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering. (At Contractor's option, pipe shields may be field fabricated using rigid calcium silicate or foamglass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".)
- L. Wrap bare copper refrigerant lines with sheet lead or molded plastic sleeve at hangers.

### **PART 3 - EXECUTION**

#### **3.1 PIPE INSTALLATION:**

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. For glycol solutions, joints on black steel screwed pipe made up with thread sealant compatible with glycol; Rectorseal No. 7, or equal.
- C. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- D. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- E. Pitch air conditioning unit drain lines down in direction of flow 1/8" per foot of horizontal run.
- F. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- G. Make horizontal water supply line size reductions using eccentric reducers (tops flat in water lines).
- H. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- I. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.

- J. Near heating and air conditioning equipment requiring water provide valved and capped water outlets of sizes shown for connection to equipment, including reduced pressure principal backflow preventers. Make final connections under HVAC work. Note that all piping and insulation downstream from backflow preventer must be painted yellow.
- K. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- L. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- M. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- N. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.

### **3.2 INSTALLATION OF VALVES:**

- A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Locate valves in piping connections to coils, heat exchangers, etc., so coils can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- C. Provide sweat to screw adaptors where required.
- D. Install with valve stems upright or horizontal.

**END OF SECTION**

**SECTION 23 1500****THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS****PART 1 - GENERAL****1.0 GENERAL:**

- A. All external duct insulation and flexible duct shall be legibly printed or identified at intervals not greater than 36 inches with the name of the manufacturer, the thermal resistance R-value at the specified installed thickness and the flame spread and smoke-developed indexes of the composite materials.

**1.1 SCOPE:**

- A. Section 230500 - "General Provisions – HVAC" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. (Items which are not "exposed" are considered "concealed".)
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

**1.2 INSULATION:**

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 231000 - "Materials and Methods - HVAC."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
  - 1. 50 for pipe covering located in air ducts, plenum or casings.
  - 2. 150 for all other pipe, duct and equipment insulation.

**PART 2 - MATERIALS****2.1 FIBERGLASS PIPE COVERING:**

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ).

- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

**2.2 FOAMED PLASTIC PIPE COVERING: (DO NOT USE IN PLENUMS UNLESS COMPLIES WITH PARAGRAPH 1.2 ABOVE):**

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in).
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction.
- E. Fit pipe hangers over insulation (see PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Where exposed outside, cover insulation with aluminum jacket (see below).
- G. Armacell, Aeroflex or Normaco.

**2.3 ALUMINUM JACKET (PIPING):**

- A. 0.016" thick smooth aluminum jacket with laminated polyethylene and kraft paper adhered liner.
- B. Roll jacket slightly smaller than insulation diameter and secure in place with flat aluminum bands 12" o.c. Lap jacket minimum 2" and place overlap at ± 120° arranged to shed water.
- C. Finish fittings on aluminum jacketed lines with 1/8" thick (dry) coat of vinyl acrylic mastic reinforced with glass cloth. In addition, provide preformed aluminum fitting jackets for outdoor fittings.
- D. Seal all joints on fitting covers with silicone sealant.



**2.4 DUCT INSULATION, INTERNAL:**

- A. Glass fiber acoustical/thermal insulation complying with NFPA 90A and UL 181 and having an erosion resistant heavy coating on the air side treated with an anti-microbial agent which does not support mold, bacteria nor fungus growth when tested in accordance with ASTM C1071, ASTM G21 and G22. NRC not less than 0.80 at 1-1/2" thickness, minimum density 1-1/2 lb/cu. ft., and maximum friction correction factor at 2000 fpm average velocity 1.15 (per TIMA test method AHS-1S2-76U). Minimum thermal conductance at R6 = 0.17 (ASTM C177). Knauf "Duct Liner E-M", Certainteed "Tough Guard" or approved equal. Submit sample to obtain approval for other manufacturers.

**2.5 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:**

- A. Flexible glass fiber insulation with foil-scrim-kraft (FSK) facing. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 1 lb./cu. ft., maximum thermal conductivity at 75°F mean temperature 0.26 BTU/(hr)(sq. ft.)(°F/in).
- B. Fire-retardant foamed plastic insulating board having a thermal conductivity at 75° mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in.). Fasten in place and seal joints with adhesive in accordance with insulation manufacturer's instructions.
1. Finish: Vimaso 749 vapor-block mastic – color grey.
  2. Armacell, Aeroflex or Normaco.

**PART 3 - INSTALLATION****3.1 DUCT INSULATION, INTERNAL:**

- A. Apply in accordance with SMACNA "Duct liner application standard" over full coverage adhesive. Coat all edges with adhesive and seal all punctures or tears with mastic before installing ducts. Cut liner to assure overlapped and compressed longitudinal corner joints. Provide mechanical fasteners and metal nosings as noted below:
1. For all velocities, provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC Units, sound absorbers, etc. **Seal all downstream edges of liner at coils, dampers, etc. Provide nosing on all upstream edges of liner. Seal all edges of liner at splitters, take-offs, and spin-ins. Provide nosing on upstream edges of liner at splitters. There shall be no unsealed edges of liner exposed to the air stream.**
  2. For velocities up to 2,000 feet per minute: start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere locate fasteners a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break.

3. For velocities from 2,001 to 4,000 feet per minute: start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere locate fasteners a maximum of 16" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break. In addition to the adhesive edge coating of transverse joints, coat any longitudinal joints with adhesive.
  4. For velocities from 4,001 to 6,000 feet per minute: same as 2 above except that metal nosing shall be installed to secure liner at all upstream transverse edges.
- B. Thickness and extent (minimum 1-1/2" thick): (Do not line supply duct transitions at connections to AC Units or supply duct transitions to air heat pumps or other fan outlets smaller than 6 square feet outlet area. Insulate these transitions as specified for externally insulated supply ducts.) Provide nosing on duct liner at all connections to equipment and at all leading edges (no adjacent upstream liner). Nosing shall fit outside the equipment flange.

### 3.2 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:

- A. For flexible glass fiber insulation:
1. Lap jacket and vapor seal all joints and seams with suitable mastic.
  2. On rectangular and flat oval ducts 30" wide (30" flat on flat oval ducts) and wider, support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.
  3. Thickness and Extent: All sheet metal supply and outside air ducts **not specified to be lined**: Minimum 2" thick except as noted below. Note: Conical and straight spin-ins on both lined and unlined ducts shall be insulated as noted below. (See Foamed Plastic Insulation below.)
- B. All metal surfaces of ceiling diffuser (CD) located above the ceiling: 2" thick (seal air tight to diffusers).
- C. Foamed Plastic Insulation:
1. Insulate portions of fire damper sleeves in insulated ducts, which are not concealed in walls, partitions and floors as specified with 3/4" thick foamed plastic insulation. Do not extend the insulation through the wall, floor or partition. Seal to wall and glass fiber insulation (or if lined duct seal foamed plastic insulation to duct with 3" lap over liner). On externally insulated duct, lap glass fiber insulation over foamed plastic and seal to foamed plastic.
  2. Insulate all flexible connectors in sheet metal ducts with 1" thick foamed plastic sheet with joints sealed. Extend insulation minimum 3" upstream and downstream of flex connector joints and seal to sheet metal duct.
  3. Insulate portions of lined ducts at manual dampers with 3/4" thick foamed plastic insulation overlapping the liner a minimum 3" upstream and downstream of the damper. Seal foamed plastic insulation to duct.
  4. Insulate all casings, headers and return bends on duct-mounted coils, and coils at terminal units with 3/4" thick foamed plastic insulation. Headers and return bends shall be insulated with 3/4" foamed plastic cemented inside galvanized sheet metal covers gasketed to coil casing.

5. Insulate all unlined ducts with dampers, all conical branch duct fittings and straight branch duct spin-ins with 3/4" thick foamed plastic insulation. Glass fiber insulation on the branch ducts shall overlap foamed plastic insulation on the conical fittings and spin-ins. Seal fiberglass to foamed plastic. For connections of flexible duct to spin-ins or conical branch duct fittings, connect flexible duct inner liner to sheet metal with specified clamps and lap outer liner and insulation over foamed plastic and clamp with Panduit strap. Seal flex duct outer cover to spin-in or conical fitting insulation. Insulation contractor shall submit sample of spin-in and conical fitting insulation and flexible duct connection for approval.
- D. Insulate portions of fire damper sleeves in insulated ducts which are not concealed in walls, partitions and floors as specified in A or B above. Do not extend the insulation through the wall, floor or partition.

**END OF SECTION**

**SECTION 23 5000****HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.

**PART 2 - EQUIPMENT AND SPECIALTIES****2.1 HEAT PUMP OUTDOOR UNIT**

- A. Outdoor unit: reciprocating compressors, heat transfer coil, fans, and inter-connecting piping and controls all enclosed in a single casing. For multiple compressor units provide separate refrigerant circuits.
- B. Casings: designed for outdoor installation, constructed of not lighter than (20) gauge galvanized steel with baked enamel finish over bonderizing. Provide access panels, condenser inlet guards and fan outlet guards.
- C. Compressors: Welded hermetic, spring isolated, with reversible oil pumps. Refrigerant: R410A.
- D. Coils: aluminum fins securely bonded to seamless copper tubes. Fans: direct driven propeller fans with weather protection for fan motors.
- E. Provide suction and discharge service valves, liquid stop valve, and solenoid change-over valves.
- F. Controls: factory wired and located in a readily accessible location. Compressor motor shall have line voltage (multi-step) contactor and both temperature and current sensitive overload devices. Include high and low pressure switches, short cycle timer, crank case heater, defrost thermostat, and defrost timer. Provide field or factory mounted low-ambient-start devices and variable air volume or fan cycling head pressure controls for stable starting and operation in ambients down to 20°F.
- G. Mount outdoor units on poured in place pad as shown.
- H. Provide 5 year non-pro-rated compressor parts warranty.
- I. Heat pumps shall be: Trane, Carrier, Daikin or approved equal.

**2.2 HEAT PUMP INDOOR UNITS:**

- A. Indoor units: supply fans, coils, filters, and drip pans, horizontal or vertical as shown.

- B. Casings: galvanized steel not lighter than (22) gauge, reinforced with angles or formed shapes with baked enamel finish over bonderizing. Casing panels: removable for access to fans, motors, coils, and bearings. Provide knockouts for piping and electrical connections. Casing shall be insulated with 1" thick foil-faced duct liner meeting the requirements of NFPA 90A.
- C. Provide statically and dynamically balanced direct driven centrifugal fans with self aligning ball bearings, adjustable speed motor (3 speed). Fan motor and drive shall be located inside unit cabinet. Provide fan starting relay for each unit.
- D. Coils: include refrigerant coils and electric heating coils. Refrigerant coils shall consist of nonferrous fins securely bonded to seamless copper tubes, and shall bear AHRI approved ratings.
- E. Drain pans: provide corrosion resistant coating and insulating corrosion-resistant fill.
- F. Filters: 1" thick MERV8 throwaway filters. Turn equipment over to Owner with clean filters and two (2) spare sets of filters.
- G. Electric Heaters:
  - 1. All heaters shall be listed in the Underwriters Laboratories, Inc. Electrical Appliance & Utilization Equipment list.
  - 2. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, NEMA 1 control box containing contactors for heaters, factory wired to terminal strips and 1/2" insulation between mounting plate and control box. All sheet metal parts in air stream aluminized or galvanized steel. Provide spaces at terminal end of heater so that internal duct insulation will not cause hot spots.
  - 3. Equip heaters with factory wired automatic high limit control and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails. Equip heaters shall be supplied with control circuits suitable for 24 volt control, factory wired to terminal blocks in control box.
  - 4. Provide staging as required by code, but not fewer stages than those shown.
- H. Indoor Units: of same manufacturer as outdoor units.
- I. Provide insulated plenum bases as shown.

### **2.3 SPLIT SYSTEM HEAT PUMP - VRF:**

- A. Split system air conditioners shall consist of a wall or ceiling mounted indoor section, outdoor heat pump unit, connecting refrigerant piping, and electronic controls. System shall be UL rated.
- B. Indoor unit shall consist of centrifugal evaporator fan(s), evaporator coil, drain pan with condensate pump and safety switch, all enclosed in a plastic casing equipped with adjustable supply grille and return air grille. Provide 3 pole disconnect switch.
- C. Outdoor unit shall consist of compressor, condenser coil, condenser fan, and controls, all enclosed in a metal grilled cabinet suitable for roof or pad mounting. Provide refrigerant piping kit, pre-insulated, properly sized for capacity shown. (See drawings to determine length.)

- D. Controls shall consist of a wall mounted remote controller utilizing a microprocessor. Functions shall include:
  - 1. Computerized dehumidification.
  - 2. Operation mode setting.
  - 3. Self-diagnostic display.
  - 4. Room temperature display.
  - 5. Twenty-four hour on-off timer.
  - 6. Fan speed indicator.
  - 7. Memory.
- E. Split system heat pump – VRF shall be Trane-Mitsubishi, Carrier, Daikin, Gree, or approved equal.

#### **2.4 SPLIT-SYSTEM 100% OUTSIDE AIR UNITS:**

- A. Vertical air handling units: factory fabricated units having capacity shown, consisting in general of a filter section, an access section, a cooling coil section, drip pan, a hot gas reheat section, supply fan sections, and supply air electric heat, all the product of a single manufacturer. Provide all sections of the same frame size with support rails for all sections. Mount units on ribbed neoprene pads on concrete curbs as shown.
- B. Casing: not lighter than 18 gauge galvanized steel, all sections of casing insulated with R6.5 polyurethane foam insulation. All sections shall be of double wall construction with solid 26 gauge galvanized steel liner on air side of all sections.
- C. Drain pans: double construction with insulation between pans and 16 gauge type 304 stainless steel inner pan.
- D. Coil sections shall be double wall solid construction with the coils scheduled. Coils shall comply with the requirements below for coils.
- E. Provide spacer sections for installing control bulbs between pre-heat and cooling coils. At least 18" space must be provided between preheat and cooling coils.
- F. Provide hinged and latched access doors in casings at fan sections, filter sections, plenum sections, upstream and downstream from cooling coils and elsewhere as shown and/or required for access to equipment and/or controls. Construct doors with 1-1/2" insulation between 2 sheets 24-gauge galvanized steel. Set doors in frames arranged so that doors will be flush with exterior of casing. Equip each door with at least 2 hinges and 2 sets of double acting latches. Latches shall be made from nonferrous metal, with a lever handle on the outside and a lever handle on the inside of the casing. Lever handle on the outside of the casing shall cam over a door pull with a stop. Doors shall be reinforced to prevent racking and warping. Install gaskets at all section connections.
- G. Automatic dampers shall comply with the requirements for automatic dampers below.
- H. Air filters: 2-inch pleated MERV 8.

- I. Provide vapor proof marine lights in all sections. Lights shall be factory wired with switches located next to access door. Wiring to be in compliance with NEC and Division 26.
- J. Fans: centrifugal fan, complying with the requirements for "Centrifugal Fans, General" statically and dynamically balanced to a peak vibration velocity of 0.157 inch/second, with corrosion resistant coating. Bearings shall be minimum L<sub>50</sub> 200,000 hour self-aligning grease lubricated ball bearings. Grease fittings shall be extended to accessible locations after units are installed. Fan and fan motor shall be mounted on spring isolated base inside unit, and snubbing isolators shall be provided for discharge flexible connections.
- K. Air Cooled Condensing Units: Variable capacity scroll compressor(s), condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.
- L. Casings: aluminum or galvanized steel designed for outdoor installation. (Galvanized steel casings shall be finished with enamel over bonderizing.) Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.
- M. Compressors: 10-100% variable capacity scroll compressors, spring isolated, with reversible oil pumps. Refrigerant: R410A.
- N. Condensers: Aluminum fins securely bonded to seamless copper tubes. Modulating hot gas reheat, ECM/VFD controlled condenser fans.
- O. Controls: factory wired and located in a readily accessible location.
- P. Mount condensing units on poured in place pad as shown.
- Q. Provide 5 year non-prorated compressor parts warranty.
- R. Units shall be Trane, Aeon, Desert Air, or approved equal.

## **2.5 VARIABLE REFRIGERANT FLOW SIMULTANEOUS HEATING AND COOLING SYSTEM**

- A. General: The variable refrigerant flow heating and cooling system is designed and specified for heat recovery simultaneously heating and cooling. Variable refrigerant flow systems manufactured by Trane-Mitsubishi, York, Samsung, Carrier or Daikin are acceptable manufacturers.
- B. Submittal Required: In addition to detailed equipment submittal noted above, successful bidder shall submit a detailed, dimensioned refrigerant piping plan showing line lengths and sizes. Refrigerant piping shall be as approved by the equipment manufacturer.
- C. System Description
  - 1. The variable capacity heat pump and air conditioning system shall be a variable refrigerant flow series heat/cool split system using simultaneous heat/cool operation. The system shall consist of multiple indoor units and one or more outdoor units manifolded for combined capacity requirements. The outdoor unit shall be direct expansion type air cooled heat pump with variable speed driven rotary compressor utilizing advanced inverter control.

2. By varying the rotational speed of the compressor, the inverter control is matching the amount of refrigerant being delivered to the needs of each zone during full and partial-load conditions. Indoor units shall be supplied as per schedule. Each indoor unit is capable of operating separately with individual temperature control. The indoor units shall be connected to the system utilizing solenoid valve kits matching the size of the indoor unit.
  3. The system shall be piped with refrigerant lines using factory supplied connectors on all branching lines. All refrigerant piping shall be insulated as specified. The system shall be charged with R410A refrigerant according to manufacturer's guidelines.
- D. Quality Assurance:
1. The units shall be listed by Underwriters Laboratory or the Canadian Standard Association (CSA / CSA-US) and bear the UL or CSA label.
  2. All factory wiring shall be in accordance with national or state electric codes.
  3. The system shall be manufactured in a facility bearing ISO 9001 and/or ISO 14001 certification which is a set of standards applying to environmental protection set by the International Standard Organization (ISO). The system shall be factory tested.
- E. Handling and Storage: The units shall be handled and stored according to manufacturer's recommendations. Each unit shall be supplied with initial charge of R410A.
- F. Warranty: The unit shall have a manufacturer's warranty (parts and labor) for a period of one (1) year from the date of installation. There shall be a six (6) year compressor (parts) warranty from the date of installation.
- G. Installation and Start Up: The system including refrigerant piping and charge must be installed and commissioned by a factory trained technician.
- Operating Range (Outdoor Ambient)  
Cooling: 14°F<sub>DB</sub> to 109 °F<sub>DB</sub>  
Heating: -4°F<sub>WB</sub> to 59 °F<sub>WB</sub>
- H. Outdoor Unit:
1. General: The outdoor unit shall be designed specifically for use with VRF inverter technology components.
  2. The unit shall be factory assembled and wired with all refrigerant and electronic controls.
  3. The refrigerant circuit shall consist of a DC Inverter type rotary compressor, motors, fans, condenser coil, electronic expansion valve, oil separators, service ports, liquid receivers and accumulators, capillary tube, 4-way valves, solenoid valves, and strainer.
  4. All refrigerant piping (suction, liquid and discharge) must be individually insulated between the outdoor and indoor units.
  5. Connectability: Up to 16 indoor units on a single outdoor unit and up to 40 indoor units on combination units. Diversity ratio 50 - 130%
  6. The sound power level shall not exceed 65 dB(A) at 3.3 feet in front at height of 4.9 feet during standard heat or cool mode. At the "Quiet" mode this value shall drop to 62 dB(A).



7. The system will automatically restart operation after a power failure lost setting. (No reprogramming).
8. The following safety devices shall be included: high pressure switch, low pressure switch, control circuit fuses, crankcase heater, overcurrent (CT method), inverter protection, anti-cycle timer.
9. Reverse-cycle Defrost for outdoor unit cycle defrost.
10. The outdoor unit shall be completely weatherproof and corrosion resistant. Unit panels shall be painted with baked enamel finish.
11. Condenser Fan:
  - a. Condensing unit shall consist of one propeller type fan direct drive 0.7 kW motor with variable speed DC inverter with high pressure switch and overcurrent (CT method) connection).
  - b. The fan shall be vertical type discharge air configuration.
  - c. The fan shall be protected with fan guard to prevent contact with moving parts.
12. Outdoor Coil:
  - a. The condenser coil shall be made of copper tubes and aluminum fins mechanically bonded.
  - b. The condenser finned area shall accommodate for system subcooling capacity in cooling mode.
  - c. The condenser finned area shall accommodate for system superheat capacity in heating mode.
13. Compressors:
  - a. Inverter Compressor: The compressor shall be a DC Inverter type scroll hermetic compressor with variable refrigerant flow capability.
  - b. Oil Separator shall be part of the discharge (hot gas) line.
  - c. Provide Suction Line Accumulators
  - d. Compressor motor shall be type IPMSM (Interior Permanent Magnet Synchronous Motor).
14. Electrical:
  - a. The power supply to the outdoor unit shall be 208/230 Volts, 3 phase, 60 Hertz
  - b. The control voltage between the outdoor units and indoor and indoor units shall be 12 VDC in 18 AWG stranded, shielded cable. The shielding must be grounded on one side.

## I. Indoor Units:

1. 4-Way Ceiling Mounted Semi-Recessed Indoor Fan Coil Units and Horizontal Fan Coil Units Ducted:
  - a. General : Unit Sizing and Cabinet:
    - 1) Semi-recessed ceiling units shall be constructed for installation in a 24" by 24" ceiling grid system without modification to the ceiling system. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air or nitrogen before shipment from the factory.
    - 2) Four-way grille shall be fixed to the bottom of the cabinet allowing two, three or four-way airflow.
  - b. Fan:
    - 1) The indoor unit fan shall be a turbo fan assembly driven by a single motor.
    - 2) The indoor unit fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
    - 3) The indoor unit fan shall consist of three speeds, Low, Mid, and High.
    - 4) The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow
    - 5) The auto air swing vanes.
  - c. Cassette Filter: Return air shall be filtered by means of an easily removable, washable filter.
  - d. Fan Coil: Return air plenum filter box 1" thick pleated filter, MERV 8.
  - e. Coil:
    - 1) The indoor unit shall be of non-ferrous construction with smooth plate fins on copper tubing.
    - 2) The tubing shall have inner grooves for high efficiency heat exchange.
    - 3) All tube joints shall be brazed with silver alloy.
    - 4) The coils shall be pressure tested at the factory.
    - 5) A condensate pan and drain shall be provided under the coil.
    - 6) Refrigerant lines to the indoor units shall be individually insulated with  $\frac{3}{4}$ " closed cell foam insulation.
    - 7) This model has a factory installed condensate lift pump.

- 8) Capacity: See the schedule on the drawings for the capacity requirement in each zone.
- 9) Power Requirements: Power requirement shall be 208 to 230 Volts single phase power

J. Wall Mount Indoor Fan Coil Unit:

1. Split system air conditioners shall consist of a wall mounted indoor section, connecting refrigerant piping, and electronic controls. System shall be UL rated.
2. Indoor unit shall consist of centrifugal evaporator fan(s), evaporator coil, drain pan with condensate pump and safety switch, all enclosed in a plastic casing equipped with adjustable supply grille and return air grille. Provide 3 pole disconnect switch.
3. Controls shall consist of a wall mounted remote controller utilizing a microprocessor. Functions shall include:
  - a. Computerized dehumidification.
  - b. Operation mode setting.
  - c. Self-diagnostic display.
  - d. Room temperature display.
  - e. Twenty-four hour on-off timer.
  - f. Fan speed indicator.
  - g. Memory.
  - h. Low ambient operation.

K. Heat Pump Vertical Indoor Units:

1. Indoor units: supply fans, coils, filters, and drip pans, vertical as shown.
2. Casings: galvanized steel not lighter than (22) gauge, reinforced with angles or formed shapes with baked enamel finish over bonderizing. Casing panels: removable for access to fans, motors, coils, and bearings. Provide knockouts for piping and electrical connections. Casing shall be insulated with 1" thick foil-faced duct liner meeting the requirements of NFPA 90A.
3. Provide statically and dynamically balanced direct driven centrifugal fans with self aligning ball bearings, adjustable speed motor (3 speed). Fan motor and drive shall be located inside unit cabinet. Provide fan starting relay for each unit.
4. Coils: include refrigerant coils and electric heating coils. Refrigerant coils shall consist of nonferrous fins securely bonded to seamless copper tubes, and shall bear AHRI approved ratings.
5. Drain pans: provide corrosion resistant coating and insulating corrosion-resistant fill.
6. Filters: 1" thick throwaway filters, MERV 8. Turn equipment over to Owner with clean filters. Provide one set of spare filters.

7. Electric Heaters:
  - a. All heaters shall be listed in the Underwriters Laboratories, Inc. Electrical Appliance & Utilization Equipment list.
  - b. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, NEMA 1 control box containing contactors for heaters, factory wired to terminal strips and 1/2" insulation between mounting plate and control box. All sheet metal parts in air stream aluminized or galvanized steel. Provide spaces at terminal end of heater so that internal duct insulation will not cause hot spots.
  - c. Equip heaters with factory wired automatic high limit control and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails. Equip heaters shall be supplied with control circuits suitable for 24 volt control, factory wired to terminal blocks in control box.
  - d. Provide staging as required by code, but not fewer stages than those shown.
8. Indoor Units: of same manufacturer as outdoor units.
9. Provide insulated plenum bases as shown.

L. Controls:

1. Zone Control:
  - a. Control of the zone (indoor) units shall be accomplished with a wired zone controller.
  - b. Zone controller models available shall be as follows:
    - 1) Standard wired zone controller with diagnostic capability
2. Intelligent controller:
  - a. This controller shall connect to the system communication trunk and provide the capability of programmed control on all of the zone units connected to the trunk.
  - b. This controller shall provide web access to the system.
  - c. This controller shall have a user interface with a touch screen.
  - d. This controller shall have BACnet serial interface with BAS.

**2.6 DOAS INDOOR UNITS:**

- A. Indoor units: supply fans, coils, filters, and drip pans, horizontal or vertical as shown.
- B. Casings: galvanized steel not lighter than (22) gauge, reinforced with angles or formed shapes with baked enamel finish over bonderizing. Casing panels: removable for access to fans, motors, coils, and bearings. Provide knockouts for piping and electrical connections. Casing shall be insulated with 1" thick foil-faced duct liner meeting the requirements of NFPA 90A.

- C. Provide statically and dynamically balanced belt or direct driven centrifugal fans with self aligning ball bearings, adjustable speed motor pulley, and adjustable motor base. (Size belt drives for 50% overload.) Fan motor and drive shall be located inside unit cabinet. Provide fan starting relay for each unit.
- D. Coils: include refrigerant coils, electric heating coils, and hot gas reheat coils. Refrigerant coils shall consist of nonferrous fins securely bonded to seamless copper tubes, and shall bear AHRI approved ratings. (R454B Refrigerant)
- E. Drain pans: provide corrosion resistant coating and insulating corrosion-resistant fill.
- F. Filters: 1" thick throwaway filters. Turn equipment over to Owner with clean filters.
- G. Electric Heaters:
  - 1. All heaters shall be listed in the Underwriters Laboratories, Inc. Electrical Appliance & Utilization Equipment list.
  - 2. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, NEMA 1 control box containing contactors for heaters, factory wired to terminal strips and 1/2" insulation between mounting plate and control box. All sheet metal parts in air stream aluminized or galvanized steel. Provide spaces at terminal end of heater so that internal duct insulation will not cause hot spots.
  - 3. Equip heaters with factory wired automatic high limit control and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails. Equip heaters shall be supplied with control circuits suitable for 24 volt control, factory wired to terminal blocks in control box.
  - 4. Provide staging as required by code, but not fewer stages than those shown.
- H. Indoor Units: of same manufacturer as DOAS condensing unit.
- I. Provide insulated plenum bases as shown.

## **2.7 AIR COOLED DOAS CONDENSING UNITS:**

- A. Include multiple reciprocating compressor(s), condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.
- B. Casings: aluminum or galvanized steel designed for outdoor installation. (Galvanized steel casings shall be finished with enamel over bonderizing.) Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.
- C. Compressors: welded hermetic compressors, spring isolated, with reversible oil pumps. Refrigerant: R454B.
- D. Condensers: aluminum fins securely bonded to seamless copper tubes. Condenser fans: direct driven propeller fans, resiliently mounted, with weather protected fan motors.
- E. Provide hot gas connection for hot gas reheat coil in DOAS Indoor Unit.

- F. Controls: factory wired and located in a readily accessible location. Provide line voltage contactor and both temperature and current sensitive overload devices and phase loss protection for compressor motor, cycle timer to limit compressor starts to 5 or 6 minute intervals, oil pressure switch, high and low pressure switches and crankcase heater. Provide field or factory mounted low-ambient-start devices and variable air volume or fan cycling head pressure controls for stable starting and operation to 0°F.
- G. Mount condensing units on poured in place pad.
- H. Provide 5 year non-prorated compressor parts warranty.
- I. Unit shall be Trane TTA or approved equal.

## **2.8 CENTRIFUGAL ROOF EXHAUSTERS:**

- A. Centrifugal power roof ventilators with AMCA certified air and sound ratings, belt or direct driven as shown. Provide permanently oiled bearings, statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap, disconnect switches, back-draft damper and outlet bird screen. For belt driven fans provide V-belt drive sized for 50% overload, adjustable pitch motor pulley and adjustable motor base. For each fan furnish an 18 gauge galvanized steel insulated prefabricated curb with integral cant. Furnish baffled sound absorbing curbs where required to obtain noise levels specified. Static pressures scheduled are external to sound curbs.
- B. Fans shall be Greenheck, Acme, Carnes, Penn or Loren Cook.

## **2.9 IN-LINE CENTRIFUGAL FANS:**

- A. AMCA approved air and sound rated direct (or) belt driven fans (as scheduled), complete with V-belt drives sized for 50% overload, self aligning grease lubricated ball bearings, adjustable pitch motor pulleys, adjustable motor bases and statically and dynamically balanced backward curved blade wheels, all enclosed in a galvanized steel housing with inlet bell and outlet duct collars. (Fan wheel and motor assembly shall be hinged for access.)
- B. Fans shall be Greenheck type SQ, Carnes, Peerless, Acme, Penn or Loren Cook.

## **2.10 CEILING EXHAUST FANS:**

- A. AMCA rated direct driven centrifugal fans designed for ceiling mounting, complete with removable white aluminum, ceiling grille insulated housing, fan speed controllers, rubber-in-shear isolators, disconnect switch, and integral back draft damper. Max. noise level: 3 sones.
- B. Fans: Greenheck SP, Acme, Penn or Loren Cook.

## **2.11 PROPELLER FANS:**

- A. AMCA rated fans, belt or direct driven as scheduled. Equip belt driven fans with V-belt drives sized for 50% overload, adjustable pitch motor pulleys and adjustable motor bases.
- B. Equip each fan with belt and wheel guards and a mounting panel not lighter than 16 gauge.

- C. Provide gravity or motor operated shutters where indicated in equipment schedule. Equip motor operated shutters with spring return motors with oil-immersed gear trains.
- D. Where indicated on plans provide fans equipped with panels reversed for supply operation.
- E. Where shown provide penthouses constructed of not lighter than 18 gauge galvanized steel and 18 gauge galvanized steel prefabricated curbs. Equip penthouses with access doors and internal insulation not lighter than 1" x 3 lb/cu. ft.
- F. Fans: Coolair, Greenheck, Acme, Stanley or Loren Cook.

## 2.12 HIGH VOLUME, LOW SPEED (HVLS) FANS

- A. Fans shall be Big Ass Fans Powerfoil X4, Greenheck DC-5, or pre-approved equal. Proposed equivalents shall meet or exceed all specifications.
- B. Complete Unit
  - 1. Regulatory Requirements:
    - a. The entire fan assembly (with or without light kit) shall be NRTL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standards 22.2 No. 60335-1 and 22.2 No. 60335-2-80.
    - b. The controller shall be compliant with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) The device may not cause harmful interference, and (2) The device must accept any interference received, including interference that may cause undesirable operation.
  - 2. Sustainability Characteristics:
    - a. The fan shall be designed to move an effective amount of air for cooling and destratification in a variety of applications (including industrial and agricultural) over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
    - b. The optional BAFCon controller shall be designed to control Big Ass Fans and lighting systems from a secure, centralized location. The system shall be designed specifically for high volume, low speed Big Ass Fans to ensure maximum control. The system shall include optional SmartSense functionality to maximize energy savings. SmartSense shall provide the capability to automatically control the speed of Big Ass Fans using information from user-determined settings and built-in temperature and humidity sensors.
    - c. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

C. Onboard Fan Control (as scheduled)

1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be pre-wired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller.
2. For fans with single-phase input, conversion to three-phase output takes place at the VFD.

D. Offboard Fan Control (as scheduled)

1. The offboard fan controller shall be constructed using a variable frequency drive (VFD) that is factory-programmed to minimize the starting and braking torques for smooth and efficient operation.
2. The offboard controller shall include an earth ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI).
3. The motor wiring shall consist of 600 V, 75°C rated THHN stranded wire in metallic conduit, VFD rated tray cable. Metal Clad (MC) cable or solid core wire shall not be used between the VFD and the motor.
4. The offboard controller shall be installed with a load reactor appropriately rated for 3% Z, which shall be located at the variable frequency drive output on 400–480 VAC or 575–600 VAC installations where distance between the VFD and the motor exceeds 50 ft (15.2 m).
5. The PWM switching frequency shall not exceed 4 kHz on 400–480 VAC or 575–600 VAC installations, or any installation where an output reactor is utilized.

E. Airfoil System

1. The fan shall be equipped with eight (8) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
2. The fan shall be equipped with eight (8) Powerfoil winglets (standard) or eight (8) Powerfoil Plus winglets (optional) on the ends of the airfoils and eight (8) AirFences® positioned on the airfoils at the optimum location for performance. Both the winglets and AirFences shall be molded of a polypropylene blend. The standard color of the winglet and AirFence shall be “BAF Yellow.”
3. Airfoil Restraint System
  - a. All 20- to 30-ft (6- to 9.1-m) diameter fans shall be equipped with a patented airfoil restraint system to provide redundant safety between the ends of the airfoils and the fan hub. The airfoil restraint system shall be available as an option on smaller diameter fans.
  - b. The airfoil restraint system shall be comprised of durable, lightweight nylon safety straps that shall extend from the winglets through the airfoils and secure to the fan hub with 12-gauge stamped steel safety clips.



- c. The straps shall be made of 1 in. (24 mm) wide heavy-duty nylon webbing rated for 825 lb (374 kg). The loops at the ends of the straps shall be secured in a double-stitch pattern for reinforced durability.
- d. The straps shall be precisely matched to each fan's diameter, eliminating the need for a tensioning mechanism and reducing opportunity for noise.
- e. The straps shall run along the inside of the airfoils for an uninterrupted look.
- f. Safety clips shall secure to each winglet to comprise the outer anchor points and provide tension, while clips on the opposite end shall secure to threaded inserts incorporated in the fan hub.

#### F. Motor

1. The fan motor shall be an AC induction type inverter rated at one of the following (as scheduled):
  - a. 1700 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase, 1.9 hp
  - b. 1700 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase, 2.5 hp
2. The motor shall be totally enclosed, fan cooled (TEFC) with an IP56 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked insulation rated Class F or higher and be capable of continuous operation in 32°F to 122°F (0°C to 50°C) ambient conditions.
3. The motor shall have a C-face attachment that shall enable technicians to detach the motor for easy field service. The C-face motor adapter shall be designed to work with the NitroSeal™ gearbox.

#### G. Gearbox

1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage or three-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range and shall be lubricated for the life of the product (no oil changes required).
2. The gearbox shall be equipped with a hollow shaft threaded to accept a 3/4" NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.

#### H. Mounting Post

1. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

I. Mounting System

1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The design of the upper mount shall provide two axes of rotation. This design shall allow for adjustments to be made after the mount is installed to the mounting structure to ensure the fan will hang level from the structure.
2. The upper mount shall be of ASTM A-36 steel, at least 3/16" thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
3. All mounting hardware shall be SAE Grade 8 or equivalent.

J. Hub

1. The fan hub shall be 19" (48 cm) in diameter and shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars, and one (1) aluminum spacer fastened with a pin and collar rivet system. The overall design shall provide a flexible assembly such that force loads experienced by the hub assembly shall be distributed over a large area to reduce the fatigue experienced at the attachment point for the fan blade.
2. The hub shall be secured to the output shaft of the gearbox by means of ten (10) high strength bolts. The hub shall incorporate four (4) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

K. Safety Cables

1. The fan shall be equipped with an upper safety cable that provides an additional means of securing the fan assembly to the building structure. The upper safety cable shall have a diameter of  $\text{\O}3/8$ " (1 cm).
2. The fan shall be equipped with two lower safety cables pre-attached to the fan hub that shall provide an additional means of securing the fan to the extension tube. The lower safety cables shall have a diameter of 1/4" (0.6 cm).
3. The safety cables shall be fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress<sup>®</sup> sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
4. Field construction of safety cables is not permitted.

L. Digital Variable Speed Wall Controller

1. The fan shall be equipped with a digital variable speed wall controller. The user interface shall be an intuitive touchscreen interface.
2. The controller shall be mounted to a standard rectangular or square outlet box.
3. CAT5 cable shall be provided with length as required for connecting the controller to the fan's VFD and to provide power to the controller. Cable shall be installed in conduit as specified in Controls Section.
4. The controller mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.

5. The controller shall have an IP55 rating.
6. The controller shall provide fan start/stop, speed, and direction control functions.
7. The controller shall provide diagnostic and fault history information for the connected fan, as well as the ability to configure fan parameters with the assistance of Big Ass Fans Customer Service.
8. The controller interface shall be able to be secured with a passcode to prevent unauthorized access to fan controls and settings.
9. The controller shall operate out of the box without setup and upon connection to CAT5 cable.

M. Fire Control Panel Integration

1. Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

N. Guy Wires

1. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

O. PREPARATION

1. Fan location shall have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.
2. Mounting structure shall be able to support weight and operational torque of fan. Consult structural engineer if necessary.
3. Fan location shall be free from obstacles such as lights, cables, or other building components.
4. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
5. Each fan requires dedicated branch circuit protection.
6. Before the controller is installed, the fan system shall be installed by a factory-certified installer according to the instructions in the fan Installation Guide.
7. Install a rectangular or square outlet box at the controller mounting location.
8. If the optional BAFCon controller will be mounted more than 250 ft (76.2 m) from the fan or if multiple fans will be daisy chained, ensure the BAFCon Accessory Kit is included. The accessory kit shall be installed by a factory-certified installer according to the instructions included with the kit.

**P. INSTALLATION**

1. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.
2. Minimum Distances
  - a. Airfoils shall be at least 10 ft (3.05 m) above the floor.
  - b. Installation area shall be free of obstructions such as lights, cables, sprinklers, or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
3. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters.
4. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - a. The maximum fan diameter shall be 24 ft (7.3 m).
  - b. The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - c. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
  - d. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72—National Fire Alarm and Signaling Code.
5. Mount the controller to a flat, readily accessible surface that is free from vibration and away from foreign objects and moving equipment. The controller mounting location must meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
6. If the SmartSense feature will be used, the optional BAFCon controller must not be mounted adjacent to or above a radiant heat source, near HVAC ventilation intakes/exhausts, on a poorly insulated exterior wall, or in a different temperature/humidity environment than the fans it will control. Additional mounting guidelines can be found in the Installation Guide.

**2.13 GAS-FIRED INFRARED SPACE HEATERS**

- A. Gas-fired infrared space heaters shall be furnished and installed in accordance with governing codes and as shown per building drawing(s) as described below:
- B. Heaters shall be SPACE-RAYLTU series tube heaters, model number(s) as shown on schedule, and manufactured by Gas-Fired Products, Inc., Charlotte, North Carolina, or approved equal.

- C. The heaters shall utilize factory assembled, highly-efficient aluminum reflectors with a reflectivity of 97.5% and designed for U-tube heaters. The tube body and u-bend shall be totally enclosed with a single reflector to maximize emitter temperature and radiant heat exchange between the firing and exhaust legs. In addition, the reflector ends shall be enclosed for maximum radiant heat output and minimum convection losses. The single reflector design shall cover the firing and exhaust legs as well as the entire u-bend. U-tube configuration made of straight tubes with individual reflectors covering the firing and exhaust legs shall not be accepted.
- D. The heater's emitter tube shall operate at an average surface temperature of 750°F-900°F and shall be made of 16- gauge calorized aluminized steel or calorized titanium alloy Alumi-Therm steel for long life (3" O.D. for LTU40-75 and 4" O.D. for LTU80-250). The emitter tube shall be calorized for longevity, corrosion resistance, high humidity, harsh environment installations (outdoor covered patios and restaurants, wash bays, golf driving ranges etc.) and high radiant efficiency. The measured surface emissivity shall be 0.83-0.86 at operating temperature. The calorization process shall produce an emitter tube that is highly radiant absorptive on the interior (0.95) and highly radiant emissive (0.83-0.86) on the exterior. The system shall have a radiant efficiency (or radiant coefficient) of 65%.
- E. To assure a high degree of safety and increased radiant efficiency, the heaters shall operate under negative pressure at all times during operation to preclude the escape of combustion gases inside the building. The heater exhaust assembly shall include a 120-volt draft inducer. The draft inducer shall be equipped with a permanently lubricated, totally enclosed and shielded, fan cooled, and heavy-duty ball bearing motor. The motor shall not require maintenance or lubrication for the life of the unit. The draft inducer assembly shall be capable of rotating 90° for vertical or horizontal venting.
- F. Heaters shall be equipped with a 24-volt direct spark ignition with automatic 100% shutoff system. Power supplied to each heater shall be 120 VAC, 60 Hz. The heater controls shall include a pressure switch designed to provide complete unit shutoff in the event of combustion air or flue blockage. The heaters shall be equipped with an on-line diagnosis monitoring light system. The three lights shall monitor the power to the heater, insufficient airflow, and the spark ignition and the combination gas valve operation.
- G. The heaters shall be factory assembled and tested. The only field assembly required is connecting the control/exhauster assembly to the factory assembled body section. This will minimize field assembly to 15 minutes per heater, which will minimize installation cost. The heaters shall not require any field wiring or adjustments to assure maximum performance and safety.
- H. The heater's burner shall consist of a heavy-duty cast iron atmospheric burner. The flame characteristics shall be highly luminous for maximum radiant heat transfer through the emitter tube wall.
- I. The heaters will be CSA design certified for vertical or horizontal venting, maximum 75 feet horizontal sidewall venting, and for 50 feet outside combustion inlet duct. There shall be no draft hoods. The combustion chamber shall be totally enclosed.
- J. Heaters shall operate satisfactorily in any position from horizontal to forty-five degrees (45°) from horizontal, and shall be suitable for vented/indirect vented applications. Heaters shall be designed to operate on natural or propane gas.

- K. Heaters shall be design certified by the Canadian Standards Association (CSA) to American National Standard Z83.20/CSA2.34. The manufacturer shall provide a written limited warranty covering the heavy one-piece cast iron burner for a period of ten (10) years, the emitter tube for a period of five (5) years, and all components utilized in the heater's control assembly for a period of one (1) year.

#### **2.14 ELECTRIC WALL HEATERS:**

- A. UL listed recessed convection heaters with finned sheathed heating elements, resiliently mounted direct driven propeller fan with motor heat shield, concealed thermostat, concealed on-off switch, high limit controls, and junction box for connecting power wiring.
- B. Cabinets: 16 gauge steel, with pencil proof welded steel bargilles (bars 1/16" x 3/8" minimum). Equip cabinet with adjustable recessing frame. Finish: Baked enamel, over bonderizing. Architect will choose color from manufacturer's standard selections.
- C. Electric wall heaters: 2 KW and larger, Markel 3400 series, less than 2 KW, Markel Series 3120, Erincraft AWH or equal.

#### **2.15 ELECTRIC DUCT HEATERS:**

- A. Slide-in heaters with all sheet metal parts inside duct aluminized or galvanized steel, listed in the Underwriters Laboratories, Inc. Electrical Appliance & Utilization Equipment List.
- B. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, control box and 1/2" insulation between mounting plate and control box. Provide spacers at terminal end of heater so that internal duct insulation will not cause hot spots. Provide general purpose control boxes for indoor heaters and weather-tight control boxes for heaters located outdoors. (Connections between control box and duct shall be airtight under 1" WG static pressure.)
- C. Control box shall contain non-fused disconnect switch, fuse blocks and fuses for each phase, 3 pole contactors for 3 phase heaters and 2 pole contactors for single phase heaters other than 277 and 120 volt heaters. (Contactors shall be designed for quiet operation.) Contactors shall be factory wired to terminal strips.
- D. Controls: SCR modulating control with factory wired automatic high limit control, air flow switch, and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails, factory supplied control circuit transformers suitable for 24 volt control, factory wired to terminal blocks in control box.
- E. Provide staging as shown.
- F. Provide camlocked duct access doors at electric heaters.

**2.16 UNIT HEATERS (GAS FIRED):**

- A. AGA approved horizontal suspended unit heaters having capacity shown. Cabinets shall have baked enamel finish.
- B. Fans shall be direct driven propeller fans with guards.
- C. Heat exchangers: alloy steel and burners shall be alloy steel, ribbon burners designed for use with natural gas.
- D. Gas valve train shall include shut-off cock, pilot cock, gas pressure regulator and single automatic gas valve.
- E. Controls shall include limit control, fan control, control circuit transformer, pilot safety. Controls shall be arranged for 100% shut-off. Pilot shall be a automatically ignited intermittant pilot. Pilot safety shall be automatically reset.
- F. Venting system shall be of separated type with separate combustion air system and direct driven power venter with air flow switch and pre- and post-purge switches.
- G. Unit heaters shall be equipped with adjustable horizontal and vertical discharge louvers.
- H. Hang unit heaters from construction overhead using at least 2-3/4" pipe hangers.
- I. Unit heaters shall be Reznor, Modine or equal.

**2.17 ELECTRIC UNIT HEATERS:**

- A. UL listed electric unit heaters having capacity shown with resiliently mounted direct driven propeller fan with guard, finned-sheathed heating elements, and enameled steel enclosure not lighter than 20 gauge. Heater shall be equipped with automatic reset high limit controls, power contactors and control transformer for 24 volt control, factory wired to terminal strips.
- B. For horizontal heaters provide adjustable horizontal louvers. For vertical heaters provide louver.
- C. For each unit heater provide room thermostat to cycle contactor and fan. Mechanical Contractor shall provide and install all control wiring in conduit and all control accessories as required for connecting wall mounted thermostat.
- D. Electric Unit Heater: Markel 5100 Series or equivalent by Chromalox, Erincraft or Berko.

**2.18 REFRIGERANT SPECIALTIES:**

- A. Install moulded desiccant core filter dryer in each liquid line. Provide throwaway dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall". For heat pump units filter dryer to be bi-directional flow.
- B. Install moisture indicating sight glass in each liquid line. Install a refrigerant charging valve in each liquid line near each sight glass.
- C. Service valves: wing cap valves, Henry with locking cover.

- D. Expansion valves: thermostatic valves with external equalizers, Sporlan.
- E. Hot gas bypass valves: self contained valves sized to pass gas flow at last step of compressor unloading and shall discharge between expansion valve outlet and distributor. Sporlan.
- F. Evaporator pressure regulating valve: sized to pass full suction gas flow rate with a pressure drop not exceeding 2 psi. Equip valve with external pneumatic connection for operation by pneumatic controls (see CONTROLS).
- G. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil. Solenoid valves for heat pump units shall be bi-directional flow.

**END OF SECTION**



**SECTION 23 6000****AIR DISTRIBUTION****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.

**1.2 SHOP DRAWINGS:**

- A. See Section 23 0500 – “General Provisions – HVAC”.
- B. Ductwork Shop Drawings shall include details of duct construction: seams, joints, gauges, reinforcing, elevations, and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors. Include access door locations and sizes. Identify on the shop drawings duct sections as they will be identified for fabrication and installation. Provide section drawings of locations where ducts cross or demonstrate with elevations that ducts will fit.

**PART 2 - PRODUCTS****2.1 GRILLES, REGISTERS AND DIFFUSERS:**

- A. General: Air devices may be Price, Titus, Krueger, Nailor, or approved equal. Titus part numbers are given for reference. Coordinate border and frame types for air devices with ceiling types as shown on Architectural Reflected Ceiling Plan.
- B. Rectangular Louver Face Diffusers One-, Two-, Three-, Four-Way or Corner Throw (LD or CD): Fixed pattern louver face diffusers, all aluminum with white enamel finish, removable cores latched in place, opposed blade dampers, adjustable multiblade scoops, #TDC,-AA. **\*(In fire rated ceilings use TDC,-FR)**
- C. Curved Blade Diffusers, One-, Two-, Three-, Four-Way Throw (CBD-I, -2, -3, -4): All aluminum adjustable curved blade diffusers with plaster frames, opposed blade dampers and multiblade scoops, white enamel finish #250-AA.
- D. Supply Registers (SR): Adjustable vertical face bars, adjustable horizontal rear bars, opposed blade dampers, plaster frames, adjustable multiblade scoops, all aluminum with prime coat finish: #272.
- E. Floor Return Registers: Same as floor supply registers, less control grid.
- F. Wall Return Registers (WRR): All aluminum, aluminum lacquer finish, horizontal bars fixed at about 35° angle, plaster frames, opposed blade damper #350. (Wall Return Grilles {WRG} Delete opposed blade damper).
- G. Wall Exhaust Registers (WER): Same as wall return registers.

- H. Ceiling Return Registers (R): All aluminum, 1/2" x 1/2" x 1/2" cube core, plaster frame, opposed blade dampers, white enamel finish #50F. Omit dampers for registers not attached to return ductwork.
- I. Ceiling Exhaust Registers (E) and Ceiling Transfer Registers (T): Same as Ceiling Return Registers.

## **2.2 SHEET METAL SPECIALTIES:**

- A. Make rectangular take-offs in low pressure supply, return, and exhaust ducts using 45° entry tap (SMACNA Duct Construction Standards "Branch Connections" figure #2-6) with manual damper with end bearings and locking quadrant in branch. Saw-mark ends of damper rods parallel to blades. End bearings and quadrants shall have air tight duct connections and shaft seals: Duro-Dyne or equal.
- B. Manual balancing dampers: comply with SMACNA HVAC Duct Construction Standards, figure 2-12 and 2-13. Equip all dampers with locking quadrants and end bearings. Saw-mark ends of damper rods parallel to blades. End bearings and quadrants shall have air tight duct connections and shaft seals, Duro-Dyne or equal.
- C. When Damper quadrants are located other than above lay-in ceilings.
  - 1. Substitute Young number 315 or 270-896C adjustable cover concealed regulators or Ventlock #677 regulators and an additional end bearing for the quadrant (regulator covers shall be white). Provide all cable, gears, joints, rods, etc. as required to place the regulator in the ceiling within 6 feet horizontal of the damper, as directed by the Architect.
  - 2. Provide an access door for access to the quadrant (See "Access Doors", hereinafter).
- D. Provide "Stand-offs" (hat sections) for damper quadrants, controls, etc., on externally insulated ducts. "Stand-offs" are required at quadrants on spin-in dampers.
- E. Branch duct connections for connecting round low pressure branches to rectangular low pressure trunks: galvanized steel spin-in or side takeoff fittings with integral dampers, collars, similar and equal to Flexmaster, Series FLD or STOD for sheet metal trunks with stand-offs. Provide integral dampers with 2" insulation build-out, shaft, U-bolt, nylon bushings, locking quadrant and handle. Gauges: as required for pressure class. (26 gauge minimum.)

## **2.3 FLEXIBLE DUCT CONNECTIONS:**

- A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans, all AC Units and all powered induction units.
- B. Install flexible connections in all ducts at building expansion joints.

## **2.4 ELECTRICAL GROUNDING:**

- A. Ground supply fans.
- B. Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

**2.5 DUCTWORK - GENERAL:**

- A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanship manner with adequate bracing and cross bracing to prevent breathing, rattling, and vibration. **DO NOT USE SNAP-LOCK SEAMS.**
- B. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #315 regulator, and Duro-Dyne end bearings elsewhere. Provide stand-offs for quadrants on externally insulated ducts. (Refer also to "Sheet Metal Specialties.")
- C. Duct dimensions are **net dimensions inside insulation**. Determine gauges by actual duct size.
- D. All duct turns (except as noted below for 90 degree turns) shall be radiused with a centerline radius of 1.5 times the duct width in the plane of the turn. At the contractor's option, 90 degree turns may be square throat elbows vanned to provide a dynamic loss coefficient ("C") not greater than 0.2 or shall be radiused. Do not use "push on" vane runners. Duct turns less than 20 degrees may be mitered. Do not use off-sets that reduce the cross-sectional area of the duct.
- E. Duct Sealing: Seal duct seams and joints after assembly as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to solvent based United Duct Sealer.
  - 1. Class A Seal: Seal all joints and seams and leak test at pressure specified. Leakage cfm per 100 sq. ft. duct surface area shall not exceed 8 times the square root of the test pressure in inches of water and no leaks shall be audible.
  - 2. Class B Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
  - 3. Class C Seal: Seal entire circumference of all transverse joints.
  - 4. Class D Seal: Seal corners of transverse joints.

**2.6 DUCTWORK - LOW PRESSURE:**

- A. Ductwork, Low Pressure, shall include: All supply, return, exhaust and outside air.
- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted below. Do not use snap-lock seam.
- C. Pressure and Seal Classes: 1" Pressure Class, Seal Class "C".
- D. Hang ducts using 1"x12-gauge galvanized straps at transverse joints but not greater than 8 ft. apart.
- E. Provide galvanized sheet steel metal ducts of sizes shown on plans, construct, hang, support and reinforce in accordance with 2" Pressure Class as contained in the current edition of the SMACNA Duct Construction Standards. Use reinforcement noted for the longest side on all sides of the duct and bolt together at corners with minimum 5/16" diameter bolts. Do not penetrate duct at reinforcement with screws. **DO NOT USE SNAP-LOCK SEAMS.**

**2.7 DUCTWORK LOW PRESSURE ROUND:**

- A. Low pressure round ductwork includes all round supply, return, outside air, and exhaust ductwork except as specified medium pressure round ductwork.
- B. Ductwork: Factory fabricated single-wall galvanized steel round spiral lock seam ducts of 28 gauge for ducts up to 14" in diameter, 26 gauge for ducts from 15" to 26" in diameter, 24 gauge for ducts 27" to 36" in diameter, and 22 gauge for ducts over 36" in diameter.
- C. Fabricate fittings by continuous brazing or electric welding. Thickness of metal for round fittings: 26 gauge for fittings up to 14" in diameter, 24 gauge for fittings 15" to 26" in diameter, 22 gauge for all fittings over 26" in diameter. Elbows shall have a center-line radius of 1.5 diameters, 5 piece construction. Take-offs shall be 45 degree laterals. Splitters (tees) shall be reducing Y-Branch with dampers.
- D. Make transverse joints using beaded slip couplings, sealing compound equal to solvent based United Duct Seal and sheet metal screws.
- E. Provide hanger straps per SMACNA table no more than 8 ft. apart. Straps shall encircle duct. Do not penetrate ductwork at hangers.
- F. No adhesive labels shall be placed on the exposed surface of exposed ductwork.
- G. Ductwork and fittings shall be United McGill Airflow, Semco, Spiral Systems, Spiral Pipe of Texas or Eastern Sheet Metal round duct and fittings, 2" WG standard.

**2.8 FLEXIBLE DUCTS:**

- A. Flexible duct connectors: 2 element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181).
- B. Flexible connectors shall not exceed 5 feet in length and turns shall not exceed 20 degrees with maximum of two turns.
- C. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.
- D. Factory insulate cold flexible ducts using insulation equivalent to that specified for cold ducts minimum R5 rating and provide continuous vapor barrier at connections to other ducts and equipment.
- E. Hang ducts in accordance with manufacturer's instructions.
- F. Flexible ducts: Thermaflex M-KC, EverClean, or Flexmaster Type 4M.

**2.9 FIRE DAMPERS:**

- A. Provide and install UL labeled 1-1/2 hour fire dampers, wherever sheet metal ducts pass through chase walls, floors outside fire chases, and elsewhere as shown or required by local code. See Architectural plans for fire ratings of walls. All fire dampers required may not be shown on mechanical plans.
  - 1. Fire dampers shall be "venetian blind" dampers. Unless otherwise shown folded blades and frames shall not obstruct air stream. Provide type C fire damper in all medium and high pressure supply ducts. Dampers in floors shall be spring loaded.
  - 2. Provide factory fabricated steel wall sleeve 3" longer than wall thickness for each fire damper and install sleeve using bolts and angles as detailed in Plate #1 of SMACNA "Fire Damper Guide."
- B. Install access door in low pressure ducts at each fire damper. Install wall or ceiling access door for access to fire dampers not accessible through lift-out ceilings. See ACCESS DOORS, below.

**2.10 ACCESS DOORS:**

- A. Access doors in low pressure ducts: galvanized steel frame flange mounted permanently secured to duct with a hinged gasketed access port held in place with thumb operated latches. Doors in insulated ducts: double thickness with insulation. Doors in non-insulated ducts: a single thickness. Size doors to permit removal of equipment or maintenance. Minimum 18" x 18" in ducts 20" or greater. Minimum 12" x 12" in ducts 14" to 18" and minimum 8" x 12" in ducts 10" to 12". If duct is less than 10", enlarge duct at access door (and fire damper, if applicable) to allow minimum 8" x 12" access door. Kees "FH" series standard pressure flanged mount. Install for flush interior on double wall doors.
- B. Mark access points in lift-out ceilings with colored vinyl stick-on discs. Locate discs on grid adjacent to point of access and coordinate location of access doors in non-accessible ceiling with General Contractor.

**2.11 RANGE HOOD (RESIDENTIAL):**

- A. Kitchen ventilation hood shall be exhaust only and cover a domestic range (sizes 30" or 36") in commercial environments used for domestic purposes only. The hood shall be ICC evaluated and certified as compliant with International Mechanical Code (IMC), International Fire Code (IFC), and Uniform Mechanical Code (UMC). If provided with a fan, the fan shall be UL 507 listed or equivalent. Hood fire suppression shall be UL listed to the UL Subject 300A. Hood shall be configured as wall style (supplied with wall mounting bracket). The hood shall be constructed by Greenheck. The hood manufacturer shall provide, on request, the necessary data that confirms compliance with the code authorities listed above.
- B. Hood shall be constructed of 18 gauge minimum, 300 series stainless steel outer shell. Hood shall be either 30" long (to cover 30" range) or 36" long (to cover 36" range). Hood shell shall be manufactured and assembled with no visible outer welds or weld marks. All internal seams shall be sealed with NSF-approved caulk, standard. A metal mesh filter shall be provided. Two (2) 2200-2700K color LED recessed hood lights shall provide over 50 foot-candles of evenly-dispersed lighting on the range below.

- C. Hood shall include factory-installed UL Subject 300A fire suppression system, including fully monitored electronic detection and actuation. No braided cable or fusible links shall be accepted. Fire suppression shall consist of two (2) mounted metal-housed temperature sensors that monitor the cooking surface and upon reaching set-point, send a signal back to the main fire system control board, which activates the tank solenoid valve and expels the wet chemical from a pre-charged tank responsible for suppression the fire. Tank pressure shall be monitored using tank pressure sensor and a fault must be displayed on the user interface if low pressure is detected.
- D. All fire suppression and control components must be easily accessible by dropping the hood into a service position to allow for service without removing the hood. Latches shall be utilized to hold the hood into place for normal operation. No thumb screws or removable hardware are acceptable.
- E. Hood system shall include either an electronic or gas shut off device that shall be field connected back to the hood via factory-provided plug and play cables. Prior to fire suppression release, the shut off device shall be responsible for disabling the range upon detecting a high temperature. Gas disconnect (if provided) shall include a 3/4" gas valve supplied with plug and play cable and a 115VAC control receptacle. Electric disconnect (if provided) shall include a 4-prong 250VAC 50A power receptacle. Other electric disconnect receptacle types are also available upon special request.
- F. Hood system with option for NFPA 101 compliance, must include: 500 CFM fan, locked (password protected) appliance disconnect with timed-automatic range deactivation, and manual pull station.
- G. User interface shall be provided to control fan, range, and lights and view system statuses, including faults/alarms. User interface shall be full color 4.3" LCD touch screen. No toggle switches or rheostats shall be acceptable. All factory and configuration settings must be accessed by touchscreen through password-protected entry. For ADA compliance, the user interface can be shipped loose to be field mounted on a wall near the hood. If shipped loose, user interface shall be provided with factory supplied plug and play cable.
- H. The hood system shall be configured as with either a factory-supplied integral fan, factory-supplied external fan, or fan by others. Integral fan options include either front recirculating or rear discharge. Front recirculating style shall include an easily accessible charcoal filter and opening in front of the hood for filtering the exhaust air before discharging back into the space. Rear discharge shall direct the air to exit the back of the hood, to discharge through a wall to the outside. External fan options include either a factory-provided inline fan (with plug and play cable) or fan by others option with a top discharge hood configuration. Top discharge shall direct the air to exit the top of the hood, to discharge through a roof or wall to the outside . All factory provided fan options shall include energy efficient electrically commutated motors (ECM) standard.
- I. Basic hood operation shall be as follows:
  - 1. User interface can be utilized to turn on and off fans, lights, and range disconnect.
  - 2. If configured for NFPA 101 life safety code, password entry will be required to engage disconnect. After range is turned on, count down timer will begin, and upon expiring will disengage the range disconnect
  - 3. Upon reaching specific set-point exhaust fan will engage automatically if not already turned on and be forced to a speed based on a temperature range.

4. Upon reaching a second higher temperature set-point, the disconnect will be automatically shut off and a warning will appear on the user interface.
  5. Upon reaching a preset temperature, the fire system will engage and discharge wet chemical on top of the range.
- J. The system can also include the following options.
1. Enclosure panels to close-off the space above the hood to the ceiling (option for external fan configuration).
  2. Finished top, when no overhead cabinets are enclosing the top of the hood (option for internal fan configuration).
  3. Wall cap (option for rear discharge fan configuration).
  4. Horn strobe, with plug and play cable.
  5. K-class 6 liter wet chemical fire extinguisher.
  6. Manual pull station, with plug and play cable (included automatically with NFPA 101 compliance).
  7. Hood shall be Greenheck GRRS or approved equal.
- K. Dry contacts are provided standard for tie into building alarm systems and supply fan integration.

**END OF SECTION**

**SECTION 23 7000****HVAC TESTING AND BALANCING****PART 1 - GENERAL**

- A. Provisions of Section 23 0500 - "General Provisions - HVAC" shall apply to and become a part of this section.
- B. The HVAC testing and balancing work specified in this section shall be done by an Associated Air Balance Council (AABC) member or by a National Environmental Balancing Bureau (NEBB) member. The Testing and Balancing Agency's (TABA) project manager shall be an AABC certified or NEBB certified testing and balancing engineer and be responsible for supervision of and certification of the work herein specified.
- C. The Testing and Balancing agency will be employed by the mechanical contractor.
- D. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Architect & Engineer. The supervisory personnel for the firm shall have at least five (5) years' experience, and all the employees used in this project shall be qualified technicians in this specific field.
- E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the Architect & Engineer to determine the balancing agency's performance capability.

**1.2 SCOPE:**

- A. All air and water balance work shall be done in accordance with the AABC National Standards for Testing and Balancing Heating & Air Conditioning Systems (AABC National Standards), or NEBB National Standards edition in force at time of bidding. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.
- B. The systems to be balanced and/or tested shall include:
  - 1. All VRF Units.
  - 2. Split system DOSA units.
  - 3. Split system Heat Pump.
  - 4. In-line supply and exhaust fans.

**1.3 DOCUMENTS:**

- A. The architect will provide the balancing agency one copy of each of the following documents:
  - 1. Project drawings and specifications.



2. Approved construction revisions pertaining to the HVAC systems.
3. Approved submittal data on HVAC equipment and systems to be installed under Division 23.
4. Approved HVAC shop drawings.
5. Approved HVAC wiring diagrams, control diagrams and equipment brochures, as appropriate.

#### **1.4 COORDINATION:**

- A. The TABA shall perform its services in close coordination with the work specified in Division 23.
- B. The plans and specifications indicate meters, valves, dampers, etc. for the purpose of adjusting the HVAC systems to obtain optimum operating conditions. In the event that any of meters, valves, dampers, etc. have been installed in a manner which will not permit their being used for their intended purpose, TABA shall so notify the Mechanical Contractor so that the above items may be correctly installed as specified in the other sections of Division 23.
- C. Work included in this section shall not be started until the systems involved meet the following conditions:
  1. Air Distribution Systems
    - a. Systems have been completed (including sealing and/or leak testing where specified) with all components properly installed and ready for operation, fans are rotating correctly, motor starters have correct overload elements, variable speed drives have been put into operation and clean filters (of the type required for finished system) have been installed.
    - b. All dampers, including automatic dampers, are operating smoothly and without binding and that the automatic dampers close tightly and open wide without binding.
    - c. The spare sheaves as specified in Section 230500, General Provisions - HVAC under Tests, Cleaning and Adjustments are on site.
  2. Automatic Control System:
    - a. Systems have been completed and are operating as designed.
      - 1) Installation is complete, all instruments (including room thermostats) have been field calibrated and operate correctly, and are set for design operating conditions.
      - 2) TABA personnel have been instructed in the proper use of and in changing set points of the various controllers including via computer or keypad if required.

#### **1.5 NOTIFICATION FOR TESTING & BALANCING WORK TO BEGIN:**

- A. When the above conditions have been met, the Mechanical Contractor shall notify the TABA in writing that the system(s) are ready for Testing and Balancing.

- B. When the TABA has been notified that the systems are ready for testing and balancing, the TABA shall inspect the various systems involved and notify Mechanical Contractor of any condition which may impede the TAB work (missing dampers, valves, incomplete control or electrical work, etc.).
- C. When the deficiencies noted above have been corrected, Mechanical Contractor shall again notify TABA that the system(s) are ready for testing and balancing.

#### **1.6 INSPECTIONS:**

- A. During construction the TABA shall inspect the installation of the piping systems, sheet metal work, control system and mechanical equipment.
- B. The inspections should be made when 60% of the ductwork has been installed and when 90% of the equipment has been installed.
- C. The TABA shall submit a brief written report of each inspection to the Mechanical Contractor.

#### **1.7 TESTING AND BALANCING PROCEDURES:**

- A. All testing and balancing work shall be done in accordance with the AABC National Standards.
- B. Air Systems:
  - 1. Fan Speed: Test and adjust fan RPM to achieve design CFM requirements.
  - 2. Current and Voltage: Measure and record motor current and voltage of each fan.
  - 3. Pitot-tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.
  - 4. Outside Air: Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and discharge air temperatures with heating and cooling coil valves shut. Make allowances for heat of compression and motor heat where applicable.
  - 5. Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
  - 6. Air Temperature: Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
  - 7. Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
  - 8. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.

9. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
10. Tolerances: Test and balance each diffuser, grille and register to within -5% and +10% of design requirements.
11. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
12. Description: Record the size, type and manufacturer of each diffuser, grille and register on air outlet data sheets.
13. Minimizing Drafts: Set grille bars for throws, diffusers for patterns and adjust all diffusers, grilles, and registers to minimize drafts in all areas.

C. Verification of Temperature Control:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Verify the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

**1.8 TEST AND BALANCE REPORT:**

- A. The test and balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing agency's certified test and balance engineer. Any drawings submitted must be to a scale of 1/8" per foot or larger.
- B. Six (6) copies or PDF electronic file of the test and balance report are required and shall be submitted to the Architect and Engineer.
- C. The report shall contain the following general data in a format selected by the balancing agency:
  1. Project Number
  2. Contract number
  3. Project title
  4. Project location
  5. Project architect
  6. Project mechanical engineer
  7. Test and balance agency
  8. Test and balance engineer

9. General contractor
  10. Mechanical subcontractor
  11. Dates tests were performed
  12. Certification
- D. The test and balance report shall be recorded on report forms conforming to the recommended forms in the AABC or NEBB National Standards. At a minimum, the report shall include:
1. Preface: A general discussion of the system, any abnormalities and problems encountered.
  2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number and calibration dates.
  3. System Identification: In each report, the VAV boxes, zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.
  4. Air handling equipment test report forms: Record the following on each air-handling equipment test form:
    - a. Manufacturer, model number and serial number
    - b. All design and manufacturer-rated data
    - c. Total actual CFM by traverse if practical. If not practical, the sum of the outlets may be used, or a combination of these procedures. For specific systems, such as ones with diversity, see the *AABC National Standards*.
    - d. Suction and discharge static pressure of each fan, as applicable.
    - e. Outside air, return air and total CFM.
    - f. Actual operating current, voltage and brake horsepower of each fan motor.
    - g. Final RPM of each fan.
    - h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
    - i. Belt size and quantity.
    - j. Static pressure controls' final operating set points.
  5. Heating and cooling-coil test forms: Record the following items on each test form:
    - a. Manufacturer.
    - b. All design and manufacturers' rated data.
    - c. Rated and actual static pressure drop across each coil.

- d. Wet-bulb and dry-bulb temperatures entering and leaving each cooling coil; dry-bulb temperatures entering and leaving each heating coil.
6. Electric Heating Coil/Duct Heater test forms: Test and record the following on each electric-heating-coil test form:
    - a. Manufacturer and model number.
    - b. All design and manufacturer rated data.
    - c. Actual operating current and voltage.
    - d. Coil location and identification number.
  7. Test and balance drawings: Include the following:
    - a. All air devices: Indicate terminal unit as air handler served from design airflow, actual airflow, neck size and air device type.
    - b. Air Handlers: Indicate mark, design supply airflow, actual supply airflow, design return airflow, actual return airflow, outside air design airflow and outside air actual airflow.
    - c. Fans: Indicate mark, design airflow and actual airflow.

#### **1.9 FINAL ACCEPTANCE:**

- A. Before Certificate of Final Payment is issued the TABA shall recheck, in the presence of the Owner's representative Architect & Engineer, specific and random selections of data recorded in the certified test and balance report.
- B. Points and areas for recheck shall be selected by the Architect or Engineer.
- C. Measurements and test procedures shall be the same as the original test and balance.
- D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.
- E. If random tests demonstrate a measured flow deviation of 10 percent or more from that recorded in the certified test and balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test and balance report submitted, and a new inspection test made, all at no additional cost to the Owner.

#### **1.10 OPPOSITE SEASON TEST:**

- A. The TABA shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

**END OF SECTION**

**SECTION 23 8000****CONVENTIONAL AUTOMATIC CONTROLS****PART 1 - GENERAL****1.1 SCOPE:**

- A. Section 23 0500 – “General Provisions – HVAC” shall apply to and become part of this Section.

**1.2 CONTROL SYSTEMS:**

- A. Furnish and install complete and ready for operation with control sequences specified below.
- B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three years: Honeywell, Johnson, Trane, Carrier or Siemens.
- C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the control manufacturer.
- D. Include the services of a full time control technician for calibrating and adjusting controls for the first two (2) working days after Owner has occupied building.
- E. Before installation, submit for approval 5 copies of complete power and control wiring and piping diagrams and list of control panel locations by room name and number. Hang a photostatic copy of the "as built" diagram, framed behind glass, in each equipment room. Provide one set of reproducible sepias of "as built" control diagrams at completion of project for the Owner's use.
- F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (Black on white).
- G. Permanently identify control devices and room thermostats, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.

**1.3 CONTROL WIRING:**

- A. Include all control and interlock wiring and power wiring for control panel in this Section. Install all control and interlock wiring in EMT. EMT and EMT fittings shall comply with the provisions of Electrical Work. **Plenum-rated communication wiring shall be allowed in lieu of conduit only when installed concealed above accessible ceilings (such as above lay-in ceilings) and shall be supported by cable tray or j-hooks on intervals not to exceed 5'-0" on center in accordance with Division 26 Specifications.**
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls and partitions.
- C. Wire all devices individually to terminal strips in control panels.

- D. Furnish necessary relays and auxiliary contactors and other accessories required. Provide interlock relays per N.E.C. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters and Motor Control Centers specified in Electrical Work.

#### 1.4 CONTROL DEVICES:

- A. Room Thermostats: 7-day programmable thermostat with LCD Touch Screen display.  $\pm 1.4^{\circ}\text{F}$  temperature accuracy from  $50^{\circ}\text{F}$  to  $90^{\circ}\text{F}$ ,  $\pm 3\%$  RH humidity accuracy from 20% RH to 80 % RH. Thermostat covers: high impact plastic. Mount at 4'-0" above finished floor in accordance with ADA. Provide remote sensors where specified.
- B. Remote Bulb Thermostats and Temperature Transmitters: Unless otherwise shown use averaging elements not less than 8 feet long for duct or casing cross sections up to 24 square feet face area and elements not less than 17 feet long for sections over 24 square feet face area.
- C. Thermometers: pipe line thermometers are specified in another Section. Install dial thermometers in ducts where shown on control diagrams, providing averaging bulbs where shown.
- D. Freezestats: manual reset, pneumatic not permitted. Locate freezestat bulbs between preheat and chilled water coils in units with chilled water coils and downstream from DX coils in units with DX coils.
- E. Firestats: single pole double throw, electric, manual reset, pneumatic not permitted. Firestats shown to be connected to the fire alarm system: compatible with fire alarm system, furnished and installed under Controls, wired under Electrical work.
- F. Smoke detectors shall be ionization detectors which detect products of combustion. Furnish, wire, and install smoke detectors under this Section. Provide smoke detectors compatible with fire alarm system specified under electrical Work and equip them with contacts for connection to fire alarm system.
- G. Flow Switches: vaporproof enclosures, McDonnell & Miller. Pneumatic not permitted.
- H. Program Clocks: 7 day electronic, automatically recharged battery operated quartz clock with number of channels required for control sequence, each channel individually programmable. Provide hand-off-auto switch for each channel. (Multiple clocks may be used to obtain required number of channels.) All clocks mounted in a flush control panel as specified. Tork or equal.
- I. Damper Operators: of sufficient power to close/open valves & dampers under operating conditions. Electric valve & damper motors shall have oil immersed gear trains & spring return to normal position.
- J. Capillary Supports: securely support all duct-mounted and casing-mounted thermostat capillaries using factory fabricated copper bulb supports.
- K. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.
- L. Anchor all items mounted on gypsum board (dry-wall) using toggle bolts or moly bolts, not expansion shields.
- M. Provide radiused copper capillary supports for freezestat and control capillaries.

**1.5 CONTROL PANELS:**

- A. Local Control Panels: construct of galvanized steel with baked enamel finish or aluminum-plywood-aluminum fronts and backs and extruded tops, bottoms, and ends. All panels shall have piano hinges and key locking latches (key panels alike). Permanently label instruments located in panels consistent with labeling on control diagram. Cement photostat of approved diagram inside each panel cover. (Include Local-Remote switching for control point adjusters on face of each panel.)
- B. Bottom of control panels shall be located not less than 2-1/2 feet above floor and top not more than 6 feet above the floor.

**1.6 INTERFACES WITH FIRE ALARM SYSTEM (FAS):**

- A. Relays actuated by FAS will be mounted in FAS Panels located in Fan Rooms, Equipment Rooms, etc.
- B. Wiring from local panels to FAS panels is included in this Section.
- C. Control point adjusters actuated by FAS System will be located in FAS Panels.
- D. Fire Alarm Panel (FAP): Furnished and installed under Electrical Work. Connections between Fire control Panel and fan starters, damper actuators, etc. shall be included under Controls (See also Section "FAS").

**PART 2 - CONTROL SEQUENCES:****2.1 GENERAL:**

- A. Control diagrams on drawings are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown on control diagrams.
- B. As shown on drawings.

**END OF SECTION**



**SECTION 26 0100  
ELECTRICAL GENERAL**

**PART 1 - GENERAL****1.01 RELATED DOCUMENTS:**

- A. The Drawings and General provisions of the Agreement including the "General Conditions", "Supplementary Conditions", and "General Requirements" of the Contract as written and referred to hereinbefore are adopted and made part of Division 26.

**1.02 SUMMARY:**

- A. The work under this Division shall consist of all labor, materials, equipment, services and related accessories, etc., necessary and required to complete all work as shown or inferred on the Drawings and in the Specifications (Contract Documents).
- B. Provide fixed electrical equipment, except where specifically noted otherwise.
- C. Provide portable electrical equipment for the complete system(s).
- D. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings and/or in specifications, as though specified by both.
- E. All equipment and wiring shall be new, except where specifically shown or specified otherwise.

**1.03 WORK INCLUDED IN THIS DIVISION:**

- A. Electrical work includes, but is not limited to:
  - 1. Arranging and coordinating with local utility companies for services required as shown or specified.
  - 2. Provide meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, and/or other equipment forming part of system.
  - 3. Connection of all appliances and equipment.
  - 4. Complete emergency lighting and power system, including:
    - a. engine-generator and transfer switches
  - 5. Complete fire alarm system.
  - 6. Complete empty raceway and junction boxes for door access security system.
  - 7. Complete empty raceway system(s) for auxiliary system(s) as shown.
  - 8. Complete grounding systems.
  - 9. Complete lightning protection system.
  - 10. Complete temporary facilities for construction power.
  - 11. Complete Inverter and Uninterrupted Power System (UPS).

**1.04 WORK NOT INCLUDED IN THIS DIVISION: (Refer to other divisions of these specifications)**

- A. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.
- B. Furring of building structure or finishes for conduit and equipment.
- C. Finish painting of conduit and equipment except for factory applied prime or finish painting specified for equipment, fixtures, devices or materials furnished under this section.
- D. Installation of motors except where specifically noted.
- E. Control wiring for mechanical systems, except where specifically indicated to be provided by Electrical Contractor.

**1.05 RELATED WORK SPECIFIED ELSEWHERE:**

- A. Classification of Excavation: Division 31 - Earthwork.
- B. Concrete Work: Division 03.
- C. Painting: Division 9 - Finishes.

**1.06 REFERENCES:**

- A. NEC: National Electrical Code (latest edition adopted by local authorities unless otherwise noted).
- B. NFPA: National Fire Protection Association.
- C. OSHA: Occupational Safety and Health Administration.
- D. UL: Underwriters Laboratories, Inc.
- E. NEMA: National Electrical Manufacturer's Association.
- F. IEEE: Institute of Electrical and Electronic Engineers.
- G. ACI: American Concrete Institute.
- H. ADA: American Disabilities Act.
- I. ANSI: American National Standards Institutes.
- J. ASTM: American Society for Testing Materials.
- K. AWS: American Welding Society.
- L. FM: Factory Mutual Insurance Association.
- M. IES: Illumination Engineering Society.
- N. ISA: Instrument Society of America.
- O. LPI: Lightning Protection Institute.

- P. NACE: National Association of Corrosion Engineers.
- Q. NETA: International Electrical Testing Association.
- R. NECA: National Electrical Contractors Association

**1.07 DEFINITIONS:**

- A. Provide: Furnish, install, connect and test until complete.
- B. Wire: Furnish all necessary wiring, connect and test until complete.
- C. Install: Furnish, set in place, wire and test until complete.
- D. Work: Materials completely installed, connected, and tested until complete.
- E. AWG: American Wire Gage.

**1.08 REQUIREMENTS OF REGULATORY AGENCIES:**

- A. Obtain and pay for all permits and inspections required for the work. Comply with all ordinances pertaining to work described herein. Pay all expenses arising from the procurement of these certificates and included in the base Contract Price.
- B. All equipment shall be installed in accordance with the latest Seismic requirements standards for this site/facility classification.
- C. Electrical Contractor shall be responsible for Seismic requirements of the Electrical System. Electrical Contractor shall contract direct with Seismic contractor to design, provide and install all Seismic equipment required for a complete installation to meet all governing code requirements. Seismic contractor must meet all qualifications specified for Electrical contractor specified herein.
- D. Install work under this Division per drawings, specifications, latest adopted edition of the National Electrical Code, (NFPA-70) including local amendments and interpretations, Local adopted Building Codes, and any special codes having jurisdiction over specific portions of work within complete installation. In event of conflict, install work per most stringent code requirements determined by Consultant.
- E. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Consultant copies of the Certificates of Inspection and approval issued by authorities and provide original copy of each certificate to the Owner.
- F. The Contractor shall not allow or cause any of the work to be covered up or enclosed until the Consultant and Owner has been notified and given reasonable opportunity (2 weeks) to review the work. When required by law or regulations, the governmental agency having jurisdiction for inspections shall be given reasonable notice and opportunity to inspect the work. Any work that is enclosed or covered up before such inspection and test shall be uncovered at the Contractor's expense; after it has been inspected, the Contractor shall restore the work to its original condition at his own expense.

**1.09 QUALIFICATIONS OF CONTRACTOR:**

- A. Has completed minimum two projects similar to this project in size and scope in past five (5) years.

- B. This qualification applies to Sub-Contractors.
- C. Contractor to use workmen experienced in their respective trade.
- D. Superintendent for work under this Division shall have minimum ten (10) years' experience and shall have worked on substantial projects in Telecommunication Buildings. Submit qualifications of Superintendent for review.
- E. Contractor has training and practices the requirements of NFPA – 70E.
- F. Owner reserves right to reject bid of any Contractor failing to meet these qualifications.

#### **1.10 DRAWINGS AND SPECIFICATIONS:**

- A. Electrical work is shown on drawings, indicated and listed "Electrical" inclusive. Follow any supplementary drawings as though listed above.
- B. Drawings and specifications are complementary. Work called for by one is binding as if called for by both. Any discrepancies between drawings and specifications shall be brought to the attention of the Consultant for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Consultant during the bidding period or by reason of any error on the Contractor's part.
- C. Drawings show general run of circuits and approximate location of equipment. The contractor shall review drawings of all trades to assure coordination prior to placement of work. Right is reserved to change location of equipment and devices, and routing of conduits within 10 feet, without extra cost to Owner.
- D. Use dimensions in figures, shop drawings, etc. and actual site measurements in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
- E. Layout equipment as shown on drawings as close as possible. Verify access requirements for equipment actually furnished and adjust layout to comply with NEC. Right is reserved to change layout within 10 feet without additional cost.
- F. Execution of Contract is evidence that Contractor has examined existing conditions, drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.
- G. No attempt has been made to establish the required sections or splits of equipment relative to the size of access into the space, building, etc. Contractor shall establish all said splits, sections, etc. necessary to install equipment complete without undue disassembly of equipment or demolition of building parts at site of work.
- H. Charges for extra work are not allowed unless work is authorized by written order from the Owner approving charges for work.
- I. Check all door swings so that light switches are not located behind doors. Relocate switches as required with the Consultant's review.
- J. Elevators: The location of switches, receptacles, lights, telephone outlets, disconnect switches, fire alarm devices, etc., in elevator pits, shafts, equipment rooms shall be located as required by the Elevator Shop Drawings and applicable codes. Coordinate size and type of all electrical devices with Elevator Contractor prior to purchase of equipment.

**1.11 EQUIPMENT PRE-ORDERED BY THE OWNER:**

- A. In order to accommodate the accelerated construction completion schedule for this project, some equipment may be pre-bid and accelerated order by the Owner.
- B. The Contractor shall be responsible for coordination through GC with Owner for the installation of, interfacing with, and connection to equipment, whether new or pre-bid, in order to ensure complete and operating systems.

**PART 2 - PRODUCTS****2.01 MATERIALS:**

- A. All material shall be new and have a U.L. label and all equipment assemblies/enclosures shall have an overall U.L. label. Only where specifically shown on drawings or prior approved in writing by engineer and if approved by local and governing authorities, equipment where U.L. label is not available shall be manufactured in accordance with applicable NEMA, IEEE and Federal Standards and all components in assemblies have U.L. label, comply with the terms "listed and labeled" as defined in the NEC 70, Article 100 and have an overall all listing label as such. Submit letter stating compliance with these requirements with bid.
- B. Utilize one of the manufacturers listed to furnish all of the major equipment (i.e., transformers, bus duct, switchgear, circuit breakers, etc.) required for this project.

**PART 3 - EXECUTION****3.01 VISIT TO SITE:**

- A. Visit site, and survey existing conditions affecting work prior to bid. Include necessary materials and labor to accomplish the electrical work, including relocation of existing services and utilities on building site in bid. No consideration shall be given to future claims due to existing conditions. Any discrepancies or interferences shall be reported immediately to the Owner.

**3.02 WORKMANSHIP:**

- A. All work performed shall be first class work in every aspect. The work shall be performed by mechanics skilled in their respective trades, who shall at all times be under the supervision of competent persons. All work shall be installed to comply with NECA's "Standard of Installation."
- B. Work that is deficient, defective, poorly laid out, not perfectly aligned, or that is not consistent with the requirements generally accepted in the trade for "first class work" will not be acceptable.
- C. In addition to the materials specified elsewhere, furnish and install all other miscellaneous items necessary for the completion of the work to the extent that all systems be complete and operative.
- D. All work under this Section shall be performed in cooperation with the work performed under all other Sections of the Specifications for the Project in order to avoid interference's and to secure the proper installation of all work. Refer to the Drawings and Specifications covering the work to be performed under all Sections, so that the relation and extent of the work of this Section with respect to the work of all other Sections is understood. Give right of way to raceways and piping systems installed at a required slope.
- E. The contractor shall arrange the times of viewing for all contractor employees and workmen.

- F. Work under this Division shall be first class with emphasis on neatness and workmanship. All work shall be installed square and plumb and concealed where possible.
- G. Install work using competent electricians, under supervision of foreman, all duly certified by local authorities. Installation subject to Consultant's constant observation, and final acceptance. Owner and the Consultant may reject unsuitable work.
- H. Conduit systems must be complete prior to installation of wiring.

### **3.03 BUILDING ACCESS:**

- A. The access into the building or onto the property for Contractor's employees, equipment and materials furnished under this Contract shall be through openings and entrances designated by Owner. Refer to Temporary Facilities, for specific requirements relative to the use of building freight elevator and other existing facilities.
- B. Coordinate the proper and necessary shipping splits of equipment with the building openings available. Contractor shall remove and reinstall any building walls, structures, etc. to move equipment into the building. Removal of structure walls must be approved by Owner/Consultant.
- C. Expediting the Work:
  - 1. Cooperate with all other subcontractors on the project. This Division shall be responsible for prompt delivery of all materials and equipment for the installation of all work under this Division, at a time and in a manner that will ensure that there will be no delay in the construction schedule.
- D. Upon the award of contract, provide a graphic schedule detailing the entire electrical installation. The schedule shall be prepared using Microsoft Project. Coordinate with the Consultant, Owner and the General Contractor and the other trades to integrate the electrical schedule with the overall project schedule. The schedule shall include the following:
  - 1. Show line items indicating each task.
  - 2. Identify linked tasks.
  - 3. Indicate the critical path.
  - 4. Indicate percent complete, start, duration times and completion dates for each task.
  - 5. Group tasks into summary groups as applicable.
  - 6. Indicate milestones for shop drawings dates, delivery dates, completion dates and test dates.
  - 7. Indicate Owner established "quiet times" as non-working times. Verify Owner quiet times with Owner prior to pricing.
- E. Update the project schedule for each project meeting or every month, whichever is more often.

### **3.04 GUARANTEE:**

- A. Furnish the Owner a written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year of Owner acceptance unless stated otherwise in other sections after final acceptance by Owner, such defects and other work damaged will be repaired and/or replaced. Submit with Operations and Maintenance Manuals.
- B. Obtain from the various manufacturers or vendors guarantees or warranties for their particular equipment or components and deliver them to the Owner. All guarantees and warranties provided shall be referenced to this project.
- C. In event that systems are placed in operation in several phases at Owner's request or as a process of the construction, guarantee will begin on date each system or item of equipment is

accepted for service by Owner. All required documentation shall be submitted prior to acceptance. Provide O&M Manuals for all equipment at time equipment is accepted for service by Owner.

- D. All guarantees and warranties shall include all travel expenses, fees, cost, labor and material at the site of installation for the duration of the guarantee period.

**3.05 OBSERVATIONS OF WORK AND DEMONSTRATION OF OPERATION (TESTING AND ACCEPTANCE):**

- A. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for observation. Provide sufficient personnel to expedite cover removal and replacement.
- B. Contractor to demonstrate operation of new equipment and/or systems to satisfaction of Owner/Engineer. Contractor to have manufacturer available for demonstration of all equipment and/or systems. Furnish affidavit signed by Owner's operation manager indicating that demonstration of operation has been performed.

**3.06 REQUIREMENTS PRIOR TO OBSERVATIONS OF WORK OR TESTING ELECTRICAL SYSTEMS:**

- A. All electrical systems and equipment require a thorough site observation and witness testing (factory and site) for Owner acceptance prior to energizing and placing into service. A minimum of two (2) weeks' notice or as stated elsewhere in writing is required for all observations or witness tests. Included in your written notice shall be details describing which portions of the electrical, fire alarm, grounding, generator, automatic transfer switches, distribution, switch controls, etc. systems are ready for inspection. For witness testing written notice, a detailed testing sequence shall be attached to include the requirements of the contract documents for review and approval. All close out documents and as-built drawings shall be submitted at or prior to the final inspection. Twenty-four (24) hours minimum prior to our travel departure time, we must receive a letter from the contractor and the sub-contractors/suppliers involved, certifying that the electrical, fire alarm, grounding, generator, automatic transfer switches, distribution, switch controls, etc. systems have been thoroughly reviewed and pre-tested to ensure all requirements of the contract documents have been met, (close-out documents are complete and as-built drawings are complete for final inspection) and no outstanding items exist.
- B. If all the above requirements and all contract document requirements are not fulfilled, all travel plans will be cancelled and must be rescheduled in co-operation with the Owner and Engineer with two (2) weeks minimum written notice in advance. If upon arriving at the site, it is determined that all requirements of the contract documents have not been met, a two (2) week minimum written notice is required for a new site visit and contractor shall be responsible and pay for all additional cost (time and expenses) incurred by Owner's Representative and Engineer for new site visit. The intent of observations and witness tests are for the Owner's Representative and Engineer to observe the installation methods, performance and functionality when complete (after troubleshooting, pre-testing, verification, etc.) to ensure, as much as practical, that the equipment was installed and operates to meet the intent of the contract documents, prior to placing into service. If equipment is placed into service prior to observation and witness testing, contractor will be responsible for all temporary equipment required to keep Owner's systems operational in order to observe, witness test and or correct deficiencies in new installations.
- C. The above requirements are to encourage the contractor not to waste the Owner's resources and ensure as much as practical that the system(s) are ready for observations and or witness testing the contractor schedules.

**3.07 COOPERATION:**

- A. Carefully coordinate work with other contractors and subcontractors. Refer conflicts between trades to Consultant. Provide necessary information to other trades for such coordination. Such information shall include Shop Drawings, Product Data and all other required data. Provide a system erection/coordination drawing showing electrical, HVAC, plumbing and architectural for installation. See Electrical Submittals Section for additional information.
- B. Whenever such information is not provided in a timely manner or whenever such information is incorrect, this contractor shall bear all costs for providing or correcting affected work of related trades with no change to the Contract Price or Construction Schedule.
- C. Owner has right to perform work in building concurrently with other contractors. Cooperation with Owner is required to complete work of all contractors.
- D. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor, Owner, and/or Consultant.

**3.08 PROTECTING:**

- A. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury. All persons working around electrical equipment shall have electrical shock and flash protection per OSHA 1910.301-309 & 331-335.
- B. Do not leave exposed or unprotected, electrical items carrying current. Protect visitors and workers from exposure to contact with electrically energized surfaces, parts, etc. in accordance with OSHA standards.
- C. Exercise particular care when working around all equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.
- D. Protect all equipment at all times.
- E. No smoking is allowed in Buildings.
- F. Avoid walking between aisles of telephone equipment. When available, walk on the aisle with the front side of the equipment, and be very careful not to bump against any components. Tool belts shall not be worn in Electrical Equipment Rooms.
- G. When working above the Electrical equipment, no cutting, drilling, trimming, or filing is permitted without dust protection against particles falling into equipment and physical protection against debris, material and tools dropping on the equipment.
- H. Do not walk on any Electrical cables. When it is unavoidable to step or stand on the cables, provide plywood or other acceptable physical protection over the cables as approved by the local operations manager.
- I. Maintain a very clean and dust free environment in Electrical equipment room. Do all unpacking, cutting, drilling and other preparatory work in areas outside the room or within dust barriers. Sweep, mop or vacuum clean work area in equipment room when required and at least daily and more often when creating significant amounts of dust as determined by local operations manager.

**3.09 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver equipment and materials to job site in original, unopened, labeled container. Products shall be properly identified with names, model numbers, types, grades, compliance labels and



other information needed for identification. Store to prevent damage and injury. Store materials to prevent corroding. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner/Consultant. Materials stored at the project site which become soiled with construction dirt, concrete, moisture or earth work shall be removed from the site and replaced with new. Do not install soiled material.

- B. Protect work and materials from damage by weather, entrance of water or dirt. Cap and mark conduit during installation.
- C. Avoid damage to materials and equipment in place. Repair, or remove and replace damaged work and materials.
- D. Protection and safekeeping of products stored on premises is responsibility of Contractor supplying same.
- E. Schedule deliveries and unloading to prevent traffic congestion blocking of access or interference with work. Arrange deliveries to avoid larger accumulations of materials than can be suitably stored at site.
- F. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations shall be referred to Consultant for remedy.

### **3.10 ANCHORS:**

- A. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved plus 100% for dead loads. Live loads shall be considered in addition to dead loads.
- B. Afterset Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect telephone equipment from drilling residue. Powder actuated "shot" type anchors are not allowed.
- C. Use preset anchor steel inserts in concrete slabs of a size and type required for rod/bolt size and live/dead loads anticipated or specified.

### **3.11 CLEANING AND PAINTING:**

- A. Clean equipment furnished in this Division after completion of work. Clean wipe the interior of all conduit, pullboxes, junction boxes, outlet boxes, and panelboard backboxes, soiled with dirt and debris prior to installation of wiring.
- B. Touch-up or re-paint damaged painted finishes as determined by Owner/Consultant.
- C. Remove debris, packing cartons, scrap, etc., from site daily.
- D. All debris shall be removed from under raised floor prior to completion.

### **3.12 EQUIPMENT FURNISHED UNDER ANOTHER DIVISION:**

- A. Electrical is responsible for reviewing for compliance of any equipment furnished by others for proper voltage, fault ratings, UL , etc. This equipment is not to be installed if compliance is not met. This includes starters, controllers, variable speed drives, chillers, motors, etc.
- B. Separately mounted starters are furnished under another Division but installed by Electrical unless specifically noted otherwise.

**3.13 CONTROL WIRING:**

- A. Control Wiring including low voltage and line voltage interlock wiring will be furnished and installed under another Division, except where specifically shown otherwise. Carefully coordinate power and control wiring interface.

**3.14 SPARE PARTS:**

- A. Where spare parts are specified in Technical Sections, furnish spare parts to Owner with itemized receipt. Contractor is responsible to deliver parts and have receipt signed by Owner's representative. Turn over receipt with as-built documents.

**3.15 HOUSEKEEPING PADS:**

- A. Coordinate with general contractor to furnish 2500 # concrete pads, 4" high, unless otherwise noted, for all freestanding equipment, i.e.: switchgear, panels, control panels, MCC's, transformers, etc. Pads shall have 1" x 45° chamfered edges and shall extend 4" beyond equipment mountings. Equipment pads that attach to existing equipment pads for a continuous line-up of equipment shall match existing pad elevations.
- B. All floor mounted electrical equipment subject to flooding shall be mounted on a 6" concrete pad.

**3.16 TRAINING:**

- A. Training for operation and maintenance of new systems or modifications to existing systems is specified in Technical sections. Contractor shall submit with as-built documents an itemized receipt signed by Owner's representative that all specified training has been received. After all work is complete.

**3.17 SAFETY AND LOCKOUT/TAGOUT PROCEDURES:**

- A. Safety of all personnel during work performed is responsibility of the Contractor. Working on and around electrical equipment and circuits requires more than normal precautions. Obtain checklist for lockout and tagout of all energy driven equipment from Architect/Engineer prior to construction. This and all Contractors shall follow these procedures.

**3.18 RESTRICTIONS: NEW AND EXISTING FACILITIES:**

- A. It is imperative that only AC outlets located in building walls and columns be used for electrical tools, cleaning equipment, etc. AC outlets installed on equipment and/or equipment frames are not to be used.
- B. No two way radios, cellular phones, or similar communications transmission devices shall be used and/or keyed within a Data Center.
- C. No flash photography or strobes shall be used within a Data Center.

**3.19 ACCESS PANELS:**

- A. The contractor shall furnish all access panels for walls, partitions, etc., and shall turn same over to General Contractor for installation at locations as directed by the Electrical Contractor. It shall be the responsibility of the Electrical Contractor that access panels are provided for access to all boxes, bus joints, equipment, etc., which may be concealed by building construction to comply with the NEC and NFPA. Access panels shall be installed so as not to interfere with lighting arrangements. All access panels shall be Milcor having factory prime coat finish. Use style "B" for lath and plaster surfaces, style "M" for brick surfaces, style "A" for acoustic ceilings. Use fire

rated access door where required in fire walls. Access panels shall be 12 inches by 16 inches, except where used in acoustic ceilings which size shall be either 12" x 12" or 12" x 24", as directed by the Consultant.

**END OF SECTION**

**SECTION 26 0121  
ELECTRICAL SUBMITTALS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF SUBMITTAL CATEGORIES**

- A. The required submittals are defined below and specified in each section. Also, refer to each item specification.
1. Requests for substitutions are written requests to use materials, equipment, etc., different from that specified.
  2. "Equivalent" Material is equipment similar to that specified which can accomplish the intent of the design without additional engineering.
  3. Shop Drawings include fabrication, layout, wiring diagrams, erection, setting, coordination, drawings and diagrams and performance data.
  4. Samples are units of work, materials or equipment items, showing the workmanship, pattern, trim and similar qualities proposed.
  5. Manufacturer's Data is standard printed product information concerning the standard portions of the manufacturer's products.
  6. Certifications are written statements, executed specifically for the project application by an authorized officer of the contracting firm, manufacturer, or other firm as designated, certifying to compliance with the specified requirements.
  7. Test Reports are specific reports prepared by independent testing laboratories, showing the results of specified testing.
  8. Industry Standards are printed copies of the current standards in the industry.
  9. Manufacturer's Product Warranties are manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed by the manufacturer if the product fails under certain conditions and times limits.
  10. Operating Instructions are the written instructions by the manufacturer, fabricator or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control and shut-down.
  11. Maintenance Manuals are the compiled information provided for the Owner's maintenance of each system of operating equipment.
  12. Maintenance Materials (spare parts) are extra stock of parts or materials for the Owner's initial use in maintaining the equipment and systems in operation.
  13. Record Drawings are accurate representations of the installed systems and wiring as recorded on a daily "as-installed" basis.
  14. Guarantees are signed commitments to the Owner that certain acts of restitution will be performed if certain portions of work fail within certain conditions and time limits.

15. Product Data includes manufacturer's data pertaining to the products, materials and equipment of the work.
16. Method of Procedures are detailed sequences of work required during interruption of service and/or connection to energized parts of systems requiring special sequences or protections.
17. Test Forms – See Section 26 0820.
18. Training – Materials and sign-off of completion.
19. Identification nomenclature – See Section 26 0553.

## **PART 2 - PRODUCTS**

### **2.01 MATERIAL MANUFACTURERS**

- A. Submit to Consultant within 30 days after award of contract a complete list of proposed material manufacturers. List does not preclude submission of shop drawings. Acceptance of manufacturer on list does not constitute acceptance of specific material or equipment. If shop drawings are submitted with non-approved substitutions, the contractor will pay the expense incurred by the consultant to review the shop drawings of any re-submittal.

## **PART 3 - EXECUTION**

Submit ALL documents in PDF format.

### **3.01 SUBSTITUTIONS AND “EQUIVALENT” MATERIAL**

- A. No material substitutions allowed, except by prior written acceptance of Consultant. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material will be given consideration only if adequate comparison data including samples are provided. Acceptance is required prior to bid date. Submit copies of substitution data ten 10 days prior to bid date. Bid substituted material only if accepted in writing by Consultant.

### **3.02 SUBMITTAL FORM AND PROCEDURES**

- A. Shop and Erection Drawings
  1. Submit shop drawings for material and equipment furnished under Electrical Division of specifications, to Consultant for review within 30 days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission, if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Consultant/Contractor. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Consultant. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by them. Do not submit paper documents. Drawing submitted without this stamp of approval will not be considered and will be returned for proper re-submission
  2. Submit shop drawings in electronic format. Shop drawings shall be submitted in a "secured" PDF format, acceptable to Consultant, but shall allow for an electronic "correction/approval" layer to be added and included in the returned electronic copy. Electronic drawing format shall be AutoCAD, latest release or accepted equivalent. Contractor shall be responsible for shop drawings distribution to all interested parties.

3. Clearly mark each shop drawing item to correspond to drawings and specifications. Any drawings not clearly marked will be rejected.
4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Consultant in writing of equipment differing from that specified.

B. Erection/Coordination Drawings

1. Prepare erection drawings when required by Consultant. Investigate thoroughly all conditions affecting work and indicate on drawing. Consultant will review erection drawings before work commences.

C. Coordination drawings will be required for the following areas, drawn to a scale of not smaller than 1/4" - 1'-0":

1. Electrical switchgear rooms.
2. UPS rooms.
3. Electrical and mechanical equipment areas.
4. Engine rooms and roof over engines.
5. Start drawings as HVAC drawings indicating all ductwork, piping, equipment and locations of mechanical room floor drains, and electrical connections. Indicate elevations of all ductwork and piping. Draw sections as required to clarify congested situations.
  - a. Next, the Plumbing Section shall add all piping, drains, sprinkler, and plumbing equipment to the drawings.
  - b. Next, the Electrical Sections shall add all electrical fixtures, conduit, busway and equipment.
  - c. Next, the drawings shall be submitted to the General Contractor for final coordination.
  - d. Finally, after the General Contractor has approved the drawings they shall be submitted to the Consultant for review.

D. Erection/coordination drawings shall be submitted using electronic format similar to shop drawings.

E. Submit final erection drawings to Owner in electronic format same as shop drawings.

F. Method Of Procedure:

1. Submit Method of Procedure for any interruption of service and/or connection to energized systems requiring special sequences, synchronization and/or protections. MOP shall be provided upon request from either the Architect/Engineer or Owner.

G. "Record" Drawings:

1. "Record" blue line prints at the completion of job. Keep set of prints on job and record day to day changes to Contract drawings with red pencil. One complete set of blue line prints will be furnished to the Contractor to indicate actual location of conduit systems, outlets, and equipment. Scan and turn over PDF prints to Consultant at final inspection.

2. After receipt of "Record" prints, Consultant will correct original Cad files and provide PDF files. Contractor shall make (and pay for) full size reproductions, laminated in 5 mil plastic (front and back).
- H. Provide laminated drawings with metal grommets (2 minimum) and mount with hooks and inserts on wall. Provide complete set of laminated documents in Main Switchgear Room and Generator Room.
- I. Maintenance Materials:
1. Submit with final close out documents a signed receipt for all maintenance materials (spare parts) specified. See Technical Sections for required materials. Furnish receipt for maintenance materials signed by Owner's Operation Manager.
- J. Product Warranties and Guarantees:
1. Submit a list of all warranties and guarantees.
  2. Submit fully executed Product Warranties and Contractor Guarantees to Owner with final close out documents.
- K. Maintenance Manuals:
- L. Submit to Consultant on secure, read only, electronic media (PDF), with format acceptable to the Owner, data prepared for each item and/or device of electrical equipment furnished in this contract completely describing and identifying equipment. Data to include serial numbers, catalog/model numbers, parts lists, description of operation, final revised shop drawings, wiring diagrams, all electrical ratings, set-up ratings and maintenance, procedures, and other data required for maintenance. See Technical Sections for other required information.
1. Submit three (3) paper copies in 3-ring binder of final Operation and Maintenance manuals after all PDF submittals have been approved by Consultant.
- M. Summary of Project Closeout Items for Owner:
1. Certificates of inspection and approval from authorities having jurisdiction.
  2. Executed Guarantees and Product Warranties.
  3. "Record" drawings.
  4. Final shop drawings.
  5. Final Erection drawings.
  6. Receipt for maintenance materials (spare parts).
  7. Maintenance manuals.
  8. Affidavit of Owner Instruction (1 copy)
  9. Receipt for keys.
  10. Completed Test Forms. See Section 26 0820.

11. Receipts for proper "Hazardous Waste" or "Universal Waste" Disposal.
12. Signed off observation and punch lists.
13. Lien waivers.

### **3.03 SPECIFIC SUBMITTAL REQUIREMENTS**

- A. Shop Drawings shall include, but not be limited to the following:
  1. Shall be drawn to accurate scale except where diagrammatic representations are specifically indicated.
  2. Shall show clearance dimensions of critical locations and show dimensions of spaces required for operation and maintenance of equipment.
  3. Shall show conduit and conductor connections and other service connections.
  4. Shall show interfaces with other work including structural support.
  5. Shall include complete descriptive data, with dimensions, operating data and weight.
  6. Shall indicate deviation from the contract documents.
  7. Shall explain deviations.
  8. Shall show short circuit current ratings for all electrical equipment.
  9. Shall show how deviations coordinate with portions of the work, currently or previously submitted.
  10. All submittals shall be submitted in PDF format.
- B. Review of shop drawings shall not relieve Contractor of responsibility for errors or omissions in shop drawings. Any equipment which will not fit into space shown on drawings shall be called to the attention of the Consultant in writing.
- C. Samples: Submit samples where requested by Consultant. Consultant's review of sample submittals:
  1. Shall be limited to general type, pattern and finish.
  2. Shall not include testing and inspection of the submitted samples.
  3. Shall not indicate complete compliance with specified requirements. Complete compliance with specifications is the exclusive responsibility of the Contractor.
- D. Manufacturer's Data:
  1. Where pre-printed data covers more than one distinct item, mark copy to indicate which item is to be provided.
  2. Contractor shall delete portions of data not applicable.
  3. Contractor shall mark data showing portion of operating range required for project application.



4. Elaboration of standard data describing a non-standard product shall be processed as a shop drawing.
5. For each product Contractor shall include:
  - a. Manufacturer's production specifications including catalog/model number.
  - b. Manufacturer's Serial Number.
  - c. Installation or fabrication instructions.
  - d. Source of supply.
  - e. Sizes, weights, speeds and operating capacities.
  - f. All electrical ratings, including temperature rating of terminals.
  - g. Conduit and wire connection sizes and locations.
  - h. All thermal ratings.
  - i. Statements of compliance with required standard and governing regulations.
  - j. Cooling requirements and makeup and/or ventilating air requirements.
  - k. Performance data, where applicable.
  - l. All sound ratings.
  - m. Other information needed to confirm compliance.
  - n. Manufacturer's recommended parts list.
  - o. Other information required by Technical Sections.
- E. Certifications: Contractor shall submit with notarized execution.
- F. Test Reports: Submit notarized test reports signed and dated by firm performing test.
- G. Manufacturer's Product Warranties: Contractor shall submit product warranties in accordance with the technical sections. Where published warranty includes deviation from required warranty, product is disqualified from use on project, unless manufacturer issues a specific project warranty.
- H. All guarantees and warranties shall include all travel expenses, fees, cost, labor and material at the site of installation for the duration of the guarantee period.
- I. Operating Instructions required:
  1. Submit manufacturer's operating instructions for each item of electrical equipment.
  2. Submit supplement with additional project application instructions where necessary.
  3. Submit specific operating instructions for each electrical system which involves multiple items of equipment.

4. Submit instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operations.
  5. All operating instructions shall be typewritten in completely explained and easily understood English language.
- J. Maintenance Manual Requirements:
1. Provide emergency instructions including addresses and telephone numbers for service sources.
  2. Provide regular system maintenance procedures.
  3. Indicate proper use of tools and accessories.
  4. Provide wiring and control diagram for each system.
  5. Provide manufacturer's data for each operational item in each system.
  6. Provide manufacturer's product warranties, and guarantee relating to the system and equipment items in the system.
  7. Provide Final Shop and Erection drawings relating to the system.
  8. Bind each operating and maintenance manual in one or more vinyl-covered, 2" 3-ring binders, plus pocket-folders for folded drawings. Index with thumb tab collated with Table of Contents for section. Mark the back spine and front cover of each binder with system identification and volume number.
  9. Also, submit Operating and Maintenance manual on secure, read only electronic media with format acceptable to Owner as indicated above. Provide necessary "HELP" files, directory, etc., as required for use. Latest "Windows" based applications are required
- K. Maintenance Materials: Deliver all materials to Owner in fully identified containers or packages suitable for storage. Obtain receipt for all delivered materials signed by Owner's Operation Manager.
- L. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal. Submit draft of each guarantee prior to execution.

**END OF SECTION**

**SECTION 26 0127  
TEMPORARY ELECTRICAL FACILITIES**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Furnish temporary electrical facilities to provide lighting and power for construction. Temporary power must be installed in accordance with the National Electrical Code, National Electrical Safety Code, local utility, local codes, and authority having jurisdiction.
- B. Coordinate temporary electrical facilities with other trades.
- C. Work or cost not included in the Section:
  - 1. Electrical energy cost during construction period.
  - 2. Circuits for equipment requiring either heavy current or special voltages. (Negotiate directly between this Division and other Divisions requesting special services).
  - 3. Circuits for exterior lighting.
  - 4. Relocation of temporary wiring after installation.
  - 5. Wiring not specified below.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. General: Provide new or used materials and equipment suitable for intended use. Ensure safe, adequate performance of facilities in accordance with governing regulations. Used equipment shall be in good, safe working order.

**PART 3 - EXECUTION****3.01 INSTALLATION AND OPERATION**

- A. Except for self-contained facilities, connect and terminate temporary electrical facilities at locations required for proper distribution.
- B. Do not subject electrical facilities on either temporary work or temporary use of permanent work to excess demand or overload.

**3.02 SERVICE CONNECTION**

- A. Obtain temporary service from Power Company. Install service in conformance with NEC 230.
- B. Include charges of Utility Company for temporary service connection. Pay all "Connect and disconnect charges of Utility Company".

**3.03 GROUNDING**

- A. Power service and distribution system shall be properly grounded in accordance with NEC requirements.

- B. Ground system neutral in accordance with NEC 250.
- C. Provide feeders and branch circuits with ground wire sized per NEC 250-95. The raceway system is not accepted as a grounding means.

### **3.04 POWER SYSTEM AND DISTRIBUTION**

- A. Provide required distribution and capacity of system. Overcurrent protection, fusible and/or circuit breakers sized per NEC.
- B. For 120/240 volts, single phase system; use 3-wire 120/240 volt feeders and branch circuits.
- C. For 120/208 volt, 3 phase, 4-wire system; use 120/208 volt balanced single phase 3-wire distribution or 120/208 volts, 3 phase, 4-wire distribution.
- D. For 480 volt, 3 phase, 3-wire distribution system; use balanced 2-wire single phase or 3-wire, 3 phase feeders for step-down to 120/240 volt or 120/208 volt utilization.
- E. For 277/480 volt distribution system; use balanced 2-wire single phase or 3 and 4-wire, 3 phase feeders for step-down to 120/240 volt or 120/208 volt utilization.
- F. Step-down transformers inside building shall be dry-type construction; protect from weather and construction damage.
- G. Use No. 12 wire for branch circuits less than 100 feet to last outlet, and No. 10 wire for circuits beyond 100 feet. Install branch circuits using NEC approved wiring methods.
- H. Balance loads connected to 3 phase services within reasonable limits.
- I. Provide ground fault protection for all circuits and loads as required by code.

### **3.05 PLUG-IN RECEPTACLES**

- A. Use 20A, duplex, NEMA grounded type or as required for special equipment.
- B. Branch circuits feeding receptacles shall be 20A or as required for special equipment.
- C. Provide receptacles to be reached by 50 foot extension cord.
- D. Protect receptacle circuits by dynamic type ground-fault circuit breaker-interrupters which automatically disconnect circuit when leakage current of 4-6MA is detected.
- E. Receptacles shall not be placed on the same circuit with temporary lighting.

### **3.06 TEMPORARY LUMINAIRES**

- A. Provide luminaires approved by NEC for temporary construction wiring.
- B. Lamps shall be rough service incandescent 150 watt to 300 watt equipped with guards to protect from contact and damage (sizes as directed).
- C. For estimating purposes, figure total number of light sockets as follows:
  - 1. One for every 300 sq. ft. of interior rooms.
  - 2. One for every 750 sq. ft. of exterior rooms with windows.

3. Exterior rooms which contain windows with room depth less than 10 feet from exterior wall, require no socket. Exterior rooms more than 10 feet deep calculated by excluding exterior 10-foot bay.
4. Provide a minimum of one luminaire in every interior room regardless of area.

### **3.07 LAMPS AND REPLACEMENTS**

- A. Provide lamps.
- B. Replace failed lamps to maintain required lighting levels throughout the duration of the project.

### **3.08 INSTALLATION OF CIRCUITS**

- A. Install required lighting and receptacle circuits along a route least objectionable to construction work as determined by Contractor. Protect circuits where exposed to damage.

### **3.09 PERMANENT WIRING SYSTEM**

- A. Do not use permanent wiring for construction without specific acceptance of Consultant. Before using permanent wiring for temporary service, submit a list of uses to Consultant. Consultant may refuse use of permanent equipment for temporary service. Use of permanent equipment prior to Substantial Completion shall not affect warranty period.

### **3.10 REMOVAL AND RESTORATION**

- A. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed. Repair or replace work damaged by temporary electrical facilities. Clean and restore permanent electrical system used to provide temporary services to condition of new and unused work.
  1. Electrical work installed as temporary facilities, upon removal, remains property of Installer.
  2. Replace lamps of permanent light fixtures used for temporary lighting which have burned out or are noticeable dim. All permanently installed fixtures in the construction area lamps shall be removed and cleaned.
  3. Where temporary use of lamps exceeds 50 percent of lamp life, replace lamps.
- B. At Substantial Completion, clean permanent electrical work used as temporary facilities. Remove debris accumulated in electrical spaces.

**END OF SECTION**

**SECTION 26 0128  
FIRESTOPPING****PART 1 – GENERAL****1.01 DESCRIPTION OF WORK:**

- A. Provide and install all firestopping and firesafing materials and accessories as required by code and/or shown, specified in these drawings and specifications.

**1.02 RELATED WORK SPECIFIED ELSEWHERE:**

- A. Electrical General Section 26 0100
- B. Raceways and Boxes for Electrical Systems Section 26 0533
- C. Cable Trays for Electrical Systems Section 26 0536
- D. Low Voltage Busways Section 26 2513
- E. Low Voltage Cable Bus Systems Section 26 2516
- F. See each of the related technical sections for sleeve requirements for each different type of penetration.

**1.03 CODES AND STANDARDS:**

- A. Standard Building Code
- B. Uniform Building Code
- C. BOCA Building Code
- D. Underwriters Laboratories – Fire Resistance Directory
  - 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials (UL723).
  - 2. ASTM E119 - Method for Fire Tests of Building Construction and Materials (UL263).
  - 3. ASTM E814 - Test Method of Fire Tests of Through-Penetration Firestops (UL1479).
- E. National Fire Protection Association (NFPA)
  - 1. NFPA-251 Standard Methods of Fire Tests of Building Construction and Materials.

**1.04 QUALITY ASSURANCE:**

- A. Fireproofing Materials:
  - 1. ASTM E119 and/or ASTM E814 to achieve a fire rating as noted on drawings.
  - 2. All fireproofing shall be UL classified for the appropriate UL system number.
- B. Surface Burning:
  - 1. ASTM E84 with a flame spread smoke developed rating of 0/5.
- C. Manufacturer:

1. Company specializing in manufacturing the products specified in this Section with minimum three years experience.

**1.05 SUBMITTALS:**

- A. Submit under provisions of Section 26 0121 – Electrical Submittals.
- B. Product Data: Provide data on product characteristics, performance and limitation criteria.
- C. Manufacturer's Installation Instruction: Indicate preparation and installation instructions. Include the UL System Numbers which apply to each application.
- D. Conform to applicable code for fire resistance ratings and surface burning characteristics.
- E. Provide certificate of compliance from authority having jurisdiction indicating approval.
- F. Provide mock-up of applied firestopping material for each type of application. If accepted, mock-up will demonstrate minimum standard for the work. Mock-up may remain as part of the work.
- G. Do not apply materials when temperature of substrate material and ambient air is below 40 degrees F or as recommended by materials manufacturer. Maintain this minimum temperature before, during, and for 3 days after installation of materials.
- H. Provide ventilation in areas to receive solvent cured materials. Use water based materials in occupied areas.
- I. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.
- J. When a fire-rated assembly in an existing facility is penetrated it shall be immediately sealed and maintained throughout the entire period of construction. Fire rated assemblies shall not remain open during the construction process in an existing facility. Temporary fire rated assemblies may be used during construction as approved by Owner/Consultant.

**1.06 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver materials undamaged in manufacturer's clearly labeled unopened containers, identified with brand, type, grade, and UL label where applicable.
- B. Coordinate delivery with scheduled installation date to allow minimum storage time at site.
- C. Store materials in clean, dry, ventilated location. Protect from soiling, abuse, and moisture. Follow manufacturer's instruction for all storage and handling.

**1.07 GUARANTEE:**

- A. Submit copies of written guarantee and agree to repair or replace sealers which fail. Failure could be in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion of project.
- B. All guarantees and warranties shall include all travel expenses, fees, cost, labor and material at the site of installation for the duration of the guarantee period.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE FIRESTOP MATERIAL MANUFACTURERS:**

- A. Hilti
- B. 3M
- C. Primer: Type recommended by firestopping manufacturer for specified substrate surfaces.

**2.02 ACCESSORIES:**

- A. Furnish fire resistant Dam Materials: Mineral fiberboard, mineral fiber matting, sheet metal or alumina silicate fire board.

**PART 3 – EXECUTION**

Verify site conditions.

Verify that openings are ready to receive the work of this section.

**3.01 PREPARATION:**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose materials, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.

**3.02 INSTALLATION:**

- A. Installers shall be trained and certified to install the fire stop systems. Installation contractors requiring training can contact manufacturer directly for no cost training on site or at manufacturer facilities.
- B. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
- C. Seal holes or voids made by penetrations to ensure an effective fire/smoke barrier.
- D. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
- E. Protect materials from damage on surfaces subject to traffic.
- F. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- G. Keep areas of work accessible until inspection by applicable code authorities.
- H. Perform under this section patching and repairing of fire stopping caused by cutting or penetration by other trades.
- I. Install backing and dam materials to arrest liquid material leakage.
- J. Label walls or floors with painted stencil indicating rating of barrier.



**3.03 APPLICATION:**

- A. Apply materials in accordance with manufacturer's instructions.
- B. Apply firestopping material in sufficient thickness to achieve rating to uniform density and texture.
- C. Install material at floors, walls or partition openings which contain penetrating sleeves, busways, cable trays, conduit and other items requiring firestopping.

**3.04 CLEANING:**

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
- D. Protect finished work.
- E. Protect adjacent surfaces from damage by material installation.

**3.05 SYSTEMS AND APPLICATION SCHEDULE:**

<u>Construction Condition</u>	<u>UL Designation</u>
A. Metal Pipe or Conduit through Round Opening	49, 95, 138, 202, 319, 321
B. Metal Pipes or Conduits through Large Opening	49, 63, 93, 94, 137, 233, 234, 319, 321
C. Busway through Rectangular Opening	97, 99
D. Cables through Opening	33, 65, 140, 204, 320
E. Cable Tray	66, 105, 139
F. Blank Opening	61, 62, 92, 102, 104, 136, 318
G. Non-Metallic (Plastic) Pipe or Conduit through Opening	64
H. Metal Pipe or Conduit through Gypsum Board Wall	147, 322
I. Non-Metallic (Plastic) Pipe or Conduit through Gypsum Board Wall	148
J. Cables through Gypsum Board Wall	149
K. Metal Pipe or Conduit through Wood Construction	159, 169
L. Non-Metallic (Plastic) Pipe or Conduit through Wood Construction	160, 167

- M. Cables through Wood Construction 168
- N. The following sections have applications for fire ratings less than 2-hours: 64, 65, 91, 147, 148, 160, 168, 169 and 320.
- O. The following sections have applications for fire ratings of 4-hours: 91, 95, 233 and 234.
- P. All sections listed have applications for fire ratings of 2-hours or less.

**END OF SECTION**

**SECTION 26 0129  
TEMPORARY FIRESTOPPING**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide and install as work is performed daily all temporary firestopping and firesafing materials and accessories as required by code and/or shown, specified in these drawings and specifications.
- B. **This does not replace permanent firestopping provided in other sections.**

**1.02 GENERAL**

- A. **All penetrations in existing or new fire rated partitions shall be provided with temporary fire stopping at the end of each workday or shift.**
- B. The Owner reserves the right to perform after hours inspection of the work site for compliance of temporary fire stopping. Any penetration lacking protection will be noted and the project superintendent notified immediately. The Owner expects prompt same day response to correct the fire rated partition penetrations. Un-satisfactory response will result in the notification of the principal(s) of the Prime Contractor with the expectation of immediate correction of the penetration. Further failure to respond will result in possible elimination of said contractor from the bidder list for future projects.

**1.03 QUALITY ASSURANCE**

- A. Fireproofing Materials:
  - 1. ASTM E119 and/or ASTM E814 to achieve a fire rating as noted on drawings.
  - 2. All fireproofing shall be UL classified for the appropriate UL system number.
- B. Manufacturer:
  - 1. Company specializing in manufacturing the products specified in this Section with minimum three years experience.

**1.04 SUBMITTALS:**

- A. When a fire-rated assembly in an existing facility is penetrated it shall be immediately sealed and maintained throughout the entire period of construction. Fire rated assemblies shall not remain open during the construction process in an existing facility. Temporary fire rated assemblies may be used during construction as approved by Owner/Consultant.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE FIRESTOP MATERIAL MANUFACTURERS**

- A. 3M brand CP25 Fire Barrier Caulk, CS195 Composite Sheet, FS195 Wrap/Strip, RC-1 Restricting Collars, Interam Fire Dam 150 caulk or moldable putty or acceptable Hilti product.

**2.02 MATERIALS**

- A. See Specification Section Detailing, Fire Stopping Systems for material required for temporary fire stopping.

**PART 3 - EXECUTION**

- A. Apply temporary fire stopping as specified in Firestopping Section. The fire stopping material must be in place prior to the contractor work force leaving at the end of their shift.
- B. Provide temporary fire stopping at any penetrations in fire rated partitions caused by the removal of existing conduits, piping, ducts, etc.
- C. All temporary fire stopping shall be replaced with the permanent fire stopping prior to project completion.

**END OF SECTION**

**SECTION 26 0519**  
**LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Furnish and install 600 volt conductors and associated splices, connectors and terminations for lighting, power, and auxiliary systems.

**1.02 STANDARDS**

- A. ICEA S-68-516
- B. NEMA WC.8
- C. UL NO. 44 and 854
- D. NEC Article 310
- E. NEMA WC-3
- F. NEMA WC-5
- G. NEMA WC-7
- H. NEMA WC-26

**PART 2 - PRODUCTS****2.01 CONDUCTORS**

- A. 98% conductivity copper; lighting and receptacle circuits shall be #12 AWG minimum. All power and control wiring shall be ASTM Class B stranded.
- B. Conductors furnished with NEC, 600 volt, insulation as follows:
- Dry locations: #10 AWG and smaller - type THW-2, THWN-2 or XHHW-2  
(Do not intermix in circuits)  
#8 AWG and larger - type RHH-2/RHW-2/USE, (cross linked polyethylene) THWN-2 or XHHW-2.
  - Wet locations: #10 AWG and smaller - type XHHW-2  
#8 AWG and larger - type RHH-2/RHW-2/USE (cross linked polyethylene) type XHHW-2
- C. Voltage rating, manufacturer, type and conductor AWG size indication shall be continuously factory-applied the entire length of each conductor. Minimally, the cable shall be marked in accordance with the NEC and any other local codes.
- D. All instrument cable shall consist of twisted shielded pair or triads. The shield shall be aluminum mylar with a stranded copper drain wire. Control cable insulation shall be XHHW-2 or THHN-2.
- E. Cables installed in a cable tray shall be UL listed for tray installation. Tray cable insulation shall be XHHW-2 or RHH-2/RHW-2/USE, and rated CT or TC by NEC.
- F. Minimum conductor size for power circuits shall be #12 AWG; wiring for controls and auxiliary systems shall be stranded #14 AWG minimum, except that current transformer leads shall be #10 AWG; minimum conductor size for distributed control and security systems shall be #16 AWG.
- G. Luminaire Wire: Incandescent - Use type SF-2, #16 AWG for luminaires up to 300 watts, and #14 over 300 watts, except for luminaires in concrete pour use #12 AWG or larger or as shown. Use type THHN-2 or XHHW-2 conductors in channels of, and in flexible connection to fluorescent luminaires.

- H. Color Code as follows and/or per local ordinances. Conductors #10 AWG and smaller with colored insulation. Conductors #8 AWG and larger not available in colors, color coded with colored pressure sensitive tape. Apply minimum 2" of tape to each individual phase or neutral conductor in half lapped pattern. Conductors shall be identified with color coded tape at all locations accessible including all splices and terminations. The equipment ground conductor shall be green for its entire exposed length. Color-code as follows:

<u>Phase</u>	<u>120/208 Volts</u>	<u>277/480 Volts</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Equip. Ground	Green	Green

- I. If an existing color code is already consistently established in the facility, all color coding of new conductors shall match the existing color code, if approved by the local authorities.
- J. Acceptable Manufacturers of copper conductors:

Pirelli  
Phelps Dodge  
Okonite  
Capital Cable  
Triangle  
Rome  
General Cable  
Southwire

## 2.02 CONNECTORS AND SPLICES

- A. Provide UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, type and class for application and for service indicated. Select connectors to comply with Project's installation requirements and as specified in Part 3 "Applications" of this Article.
- B. For Conductors #10 AWG and Smaller: Wire and cable connectors shall be solderless, twist on, electrical spring type connectors, or insulated crimp sleeve connectors. Connectors rated 600 volts, 105°C., shall comply with UL 486A/C standards. Connectors coded for easy selection compatible with wiring to be spliced. Install connectors as recommended by manufacturer. Use proper crimping tool where crimp sleeves are used.

- C. Acceptable Connector Manufacturers:

3M- "Scotchlock"  
Buchanan - "B Cap"  
Thomas & Betts - "Stak-On"  
Ideal - "Wing Nuts"

- D. Mechanical splices and tap connectors for feeder conductors shall be mounting block type, insulated with clamp-on molded covers that accommodate the lug types specified herein.

- E. Acceptable Mechanical Connector Manufacturers:

Burndy Engineering Company  
O-Z Gedney  
Thomas and Betts

- F. Make conductor taps #8 and larger from a second conductor with 98% conductivity bolted insulated connector, IlSCO "KUP-L-TAP" or accepted equivalent.
- G. Compression Splices: Splice conductors #8 and larger with solid long copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy "Hydent". Insulate splices with 600 volt, 105°C, "heat shrink", "cold shrink" covers, or taped insulation consisting of rubber, friction and vinyl tapes applied per manufacturer for 600 volt, 105°C covering.
- H. Acceptable Splice and Tape Manufacturers:
- Burndy
  - Thomas & Betts
  - IlSCO
  - Anderson
  - Blackburn
  - Oz/Gedney
- I. Connectors and/or Terminations for Conductors #8 AWG and larger: Tin plated, 98% copper, dual crimp long barrel compression lugs with two bolt holes, insulated with molded covers to accommodate 1/2" bolts. Apply with hydraulic tool recommended by manufacturer.
- J. Acceptable Manufacturers and Products
- O-Z Gedney
  - Burndy Engineering Company "Hylugs"
  - Thomas and Betts, "Color Keyed"
  - Anderson
- K. Mechanical Lugs, where approved, connected to copper bus: 98% conductivity copper or bronze Thomas & Betts "Locktite", Burndy "QA" or accepted equivalent.
- L. Use pulling lubricant which will not be detrimental to insulation of conductors indicated by published user information.
- M. Acceptable Manufacturers of Lubricant:
- Ideal Industries
  - Panduit Corp.
  - OZ/Gedney
  - Plymouth/Bishop
  - American Polywater Corp.
  - Thomas & Betts
- N. Insulate all live joints to 600 volts with strip rubber, friction tape, and electrical vinyl tape installed in accordance with manufacturers recommendations.
- O. Acceptable Tape Manufacturers:
- 3M
  - Plymouth

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Coat all electrical terminations, connection, splices, etc. with NO-OX-ID lubricant.

- B. Install wiring complete with connections to equipment. All critical feeder conductors shall be in rigid steel or IMC conduit.
- C. No branch wiring installed until after plastering, sheetrock finishing, and similar work is complete and dry.
- D. Install wiring so conductors are not in tension in completed system.
- E. Form wiring neatly and group in circuit. Tie grouped conductors with nylon ties, T&B "Tyrap" or approved equivalent.
- F. Each conduit run shall be run complete end to end before conductors are installed.
- G. Use pulling lubricant to decrease pulling tension for all feeder cables, and all difficult cable pulls of any type or size. Pull all conductors into raceway at the same time.
- H. Provide cable supports, at locations required by NEC and/or as shown. Supports with malleable screwed conduit fitting and non-conductive wedges drilled for the size conductors installed. Provide supports rated for all types of insulation and all voltage. Cable supports shall be O.Z./Gedney type "R" or accepted equivalent. Furnish pullbox, sized per NEC for each cable support.
- I. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full size conductor and lugged type connection.
- J. The maximum "shiner" (visible copper space between end of lug / splice barrel and the insulation of the conductor) for phase and neutral conductors shall be no greater than 1/16 inch. If the shiner is greater than 1/16 inch and less than ¼ inch the space shall be covered with clear heat shrink tubing. If the shiner exceeds ¼ inch, the connection shall be remade. The shiner for a ground conductor shall not exceed 1/16 inch even if covered with clear heat shrink or provide clear heat shrink tubing over all new compression lug barrel and end of conductor insulation.
- K. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power cables exposed in vaults, inside pull boxes, exposed in manholes, exposed in switchboard, termination compartments, etc. See Section 26 0553 for nameplates and labels.
- L. Join and terminate copper conductors individually. Do not mix voltages in the same raceway.
- M. Provide lugs where not furnished as part of equipment - furnish as specified above, to connect all conductors.
- N. Furnish lugs for conductors #1/0 and larger with two bolt tongue or accepted equivalent single bolt tongue with anti-turn devices.
- O. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected. See Section 26 0553 for labels.
- P. Connect circuits and feeders as shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC. Circuitry shall not be run in elevator shafts and hoistways.
- Q. All conductors making up parallel feeders to be same size, same type, and same insulation, all cut same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner. Parallel conductors shall not be run in the same raceway.
- R. DO NOT COMBINE CIRCUITS unless specifically approved by the Consultant.



- S. Neutral conductors shall not be used for equipment grounding.
- T. Provide a separate grounding conductor for all GFI circuits or GFI devices to ensure an adequate ground-fault return path.
- U. Use #10 AWG for all 20 amp, 120 volt homerun circuits that exceed 75 feet from center of load and 150 feet for 277 volt circuits.

**END OF SECTION**

**SECTION 26 0526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications. See grounding details on the drawings and refer to Standards included with these specifications for further details.
- B. Provide and install a complete grounding system as shown and specified herein.

**1.02 SUBMITTALS**

- A. Submit complete shop drawings for grounding systems in accordance with Section 26 0121 Submittals. Submit Layouts, and Product Data for grounding rods, connectors, connection materials, and grounding fittings as required to describe complete system installation.
- B. Submit 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.
- C. Provide Field tests and observation reports by a certified testing organization to ensure compliance with performance requirements. See Section 26 0820 Testing of Electrical Systems for additional tests and reporting requirements for all testing.

**1.03 STANDARDS**

- A. NFPA 70, Article 250 - Grounding.
- B. IEEE Standard 142 Recommended Practice for Grounding of Industrial and Commercial Power System.
- C. IEEE Standard 1100 Power and Grounding Sensitive Electronic Equipment.

**PART 2 - PRODUCTS****2.01 ELECTRICAL SYSTEM AND EQUIPMENT GROUNDING**

- A. All products shall be UL listed and labeled.
- B. Bond and ground main service neutral, cabinets, equipment, conduits, etc., per the latest edition of NEC and as shown on the drawings and specified herein.
- C. Ground conductors shall be 98% conductivity copper, either tinned bare or with green THWN-2 insulation. Other conductor requirements shall be the same as described for low voltage, 600 volt, conductors.
- D. Where thermal weld process is specified, use exothermic process which ends with welded copper to copper connection or copper to steel (for bonding) connection.
- E. Acceptable Thermal Weld Manufacturers:

## Cadweld by Erico Products

- F. Where compression connectors are specified utilize long barrel, solid copper heavy duty connectors applied with appropriate compression tool.
- G. Acceptable Compression Connector Manufacturers:
- Burndy
  - Anderson
  - Thomas & Betts
- H. Ground Connections:
1. Splices and Taps:
    - a. Thermal weld - utilize smokeless single shot exothermic connections for solid wire inside. Standard exothermic process may be used outside.
    - b. Compression - Solid long barrel copper, compressed with appropriate tool recommended by connector manufacturer. Use compression connections for stranded wire only.
  2. Lugs:
    - a. Solid Wire - Use thermal weld lug (smokeless inside) with two bolt tongue.
    - b. Stranded Wire - Use solid long barrel copper sleeve, crimp type compression connector, with two bolt tongue, compressed with appropriate tool recommended by connector manufacturer.
  3. Thoroughly clean connection surfaces prior to installation of clamps and/or lugs.
  4. Where mechanical connections are unavailable, i.e., pipe clamps, et al, use bolted bronze mechanical connectors. Do not use clip-on connections.
  5. Piping and conduit clamps: Use Burndy "GAR" or Penn Union type GPL, (no substitution unless accepted equivalent), size as required for piping
  6. Seal connections between dissimilar metals (i.e.: bronze to steel), with "No-OX-ID 'A' Special" compound as manufactured by Sanchem, Inc.

**2.02 AC EQUIPMENT GROUNDING CONDUCTORS**

- A. Provide lighting and power branch circuits with green covered ground (ACEG) wire sized per NEC, or as shown, except not smaller than #12 AWG. Bond ground wire to all outlet boxes, junction and pull boxes, cabinets, equipment, etc., with self-tapping screw or bolt and appropriate lug. See Section covering "Raceways" for use of grounding bushings.
- B. Bond all electrical equipment enclosures and conductor enclosures including metal raceways, outlet boxes, cabinets, switch boxes, motor frames, engine generator frame, transformer cases, and metallic enclosures for all electrical equipment.
- C. Provide separate ACEG grounding conductor for all circuits to ensure adequate ground fault return path.

- D. Bond ACEG green wire to metal equipment enclosure at source and at apparatus served.
- E. Minimum size for ACEG green wire ground lead per NEC 250 Table, or as indicated.
- F. Insulation of ACEG ground conductors shall be green. If conductor is not available with green insulation, wrap entire length of conductor where exposed in cabinets, junctions, outlets, etc. with overlapped green tape.
- G. Do not use grounded current return conductors (neutrals) for equipment grounding.
- H. Connect common system grounding conductor to supply side of service disconnect unit only. Where ground fault protection is provided, connect service neutral to ground on service side of ground fault current transformer.
- I. Do not ground the neutral conductor after it has been grounded at service entrance, or other separately derived system, i.e.: transformer, generator, etc.
- J. Maintain electrical continuity of conduit systems by threaded fittings with joints made-up wrench tight. Install insulated bushing and locknuts on terminating conduits. Provide conduits containing ACEG ground wires with grounding bushings bonded to ground wire with short full size jumper.
- K. Install separate ground conductors in heavy wall PVC conduit.
- L. Where individual ground conductors are run in PVC conduit, Do Not completely encircle conduit with ferrous and/or magnetic materials. Use one hole conduit straps and/or use nylon bolts and spacers in Minerallac and similar type encircling straps.
- M. Bond ground conductor to metal raceway at each end of the run when grounding conductors are run in metallic conduit.
- N. Buried or concealed portions of all ground systems shall not be covered until observed and accepted by Consultant/Owner.
- O. Where conductors pass through sheet metal pullboxes, bond ground conductor to box.
- P. Provide receptacles with #14 AWG green covered bonding jumper from the grounding terminal screw connected to outlet box and the branch circuit ACEG conductors. Use of self-grounding receptacles does not nullify this requirement.

### **2.03 GROUNDING ELECTRODE AND REFERENCE GROUND SYSTEM**

- A. Provide driven ground rods (or other made electrodes as shown) and buried ground conductor interconnecting ground rods as shown and per the requirements herein.
- B. Install system of copper bus bars (Main Ground Bus, (MGB), and Secondary Ground Bus (SGB)) as shown connected together with 750 MCM copper conductor or as shown on drawings.
- C. Bond and Reference the grounding system to the GB bus and the main water pipe and/or driven ground system as shown.
- D. Install an interior ring ground conductor in Telephone Power Rooms, Equipment Rooms, Generator Rooms, etc. as shown and detailed.
- E. Purpose of Reference Ground System is to provide reference ground point for Electrical equipment, and path for any induced lightning on equipment.

- F. See details on drawings for construction of ground bars, identification of components, etc.
- G. Ground Conductors
1. Buried: Solid bare tinned #2AWG copper sizes unless shown larger.
  2. Interior (exposed): Bare stranded tinned copper or green insulated copper, size as shown.
- H. Ground Connections
1. Buried and/or concealed inside building: Thermal weld process.
  2. Interior Exposed wire connection requirements:
    - a. Solid Wire: Use smokeless thermal welded connections for solid wire as shown.
    - b. Stranded Wire: Use Solid, long barrel copper connectors, compressed with appropriate tool recommended by connector manufacturer. Use compression connectors for stranded wire only.
    - c. Where exposed taps are made to stranded conductor interior ground rings, use wrought copper, split H tap copper compression taps or accepted equivalent.
    - d. Lugs: Solid wire to bus - Use thermal welded copper lug with two bolt tongue.
    - e. Stranded wire to bus - Use long barrel copper sleeve, two hole compression connector, with two bolt tongue.
    - f. Piping Connections: Heavy cast bronze or copper equivalent to Burndy GAR or Penn Union GPL (no substitution).
    - g. Stranded wire to solid wire - use thermal weld connection.
- I. Preparation and Seal: Clean all connection surfaces and coat connection surfaces with "No-OX-ID 'A' Special" compound as manufactured by Sanchem, Inc.
- J. Install all compression connectors with hydraulic compression tools recommended by manufacturer of connector to provide correct circumferential pressure. Provide embossing die code to make a visible indication that a connector has been adequately compressed on grounding conductor.
- K. Ground Rods: In general, use 5/8" diameter x 8' (minimum) or 3/4" diameter x 10' copper clad steel (equivalent to Copperweld). Where shown longer than 10' use sectional copper clad steel rods driven to depth indicated. Rods are to be spaced not less than 10 feet nor more than 15 feet apart around the ring or counterpoise system.
- L. Ground Busses: 1/4" thick solid, hard drawn copper drilled as shown. Provide 2" ± standoff insulators, G.E. Benelex, (3/8" bolt size). Provide pre-drilled holes, to accommodate bolts on 1" centers, see details for bolt pattern. See Details on drawing. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.

## 2.04 IDENTIFICATION

- A. Ground Conductors: Shall be bare tinned, or green insulated as indicated.

- B. Ground Bus: Master nameplates shall consist of green laminated plastic with 1/2" high white letters indicating function of ground bus, i.e.: "Main Ground Bus", "Secondary Ground Bus", etc. as shown.
- C. Where ground busses are concealed (above ceiling or below raised floor), provide nameplate similar to master nameplate, except add text "above ceiling" or "below floor" as applicable.
- D. Identification tags: Install tags on all ground connections to piping, electrode, and/or ground busses and for all Electrical equipment grounds. Provide tags identifying the origin and location of each ground wire at each Ground bus and water pipe connection, i.e.: "Transformer 2B wall mounted and adjacent to Column B1". Text of identification shall be as directed by Owner Representative or as shown on drawing. Each tag shall also include text "Do Not Disconnect".
- E. Tags for ground connections shall be green laminated plastic with white core engraved as described above and laced to conductor with nylon ties. Use 3/16" high letters.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Buried or concealed ground systems: Shall be accepted by Consultant/Owner Representative before backfilling or covering.
- B. Exterior buried ground conductors installed a minimum of 2'-6" below finished grade or below frost line whichever is greater. The top of the ground rods shall be driven to minimum 2'-6" below grad or to the level of the buried ground conductor.
- C. All grounding system conductors shall maintain a downward or horizontal direction where possible. Minimum bending radius of ground conductors shall be 12". Sharp bends will not be allowed.
- D. Install separate ground conductors in heavy wall, Schedule 40 PVC. Where PVC conduit is used, do not encircle the conduit completely with magnetic metal, i.e.: Conduit straps, junction boxes, etc. Use one hole straps with nylon screws, fiberglass Unistrut channels, etc. to mount conduit.
- E. Where encirclement cannot be avoided, bond main conductor to metal encirclement with #6 AWG and H Tap compression connector.
- F. Bond ground conductors run in metal conduit to the conduit at all breaks and each end of run with full size conductor.
- G. Coat all connections between dissimilar metals with "No-OX-ID 'A' Special" compound as manufactured by Sanchem, Inc.
- H. Paint all ground wires embedded in concrete with asphaltum extending 2" outside of concrete encasement.
- I. Bond all miscellaneous metal masses within 6' of the grounding conductor with #6 AWG copper conductor as shown.
- J. Ground the main electrical service neutral and separately derived electrical systems at the main disconnect and/or transformer. Ground at one location only per the National Electrical Code. Bond to the Office Principal Ground Point bus (OPGP) unless specifically shown otherwise.
- K. Install a separate ground conductor from each generator to the ground bus as shown.

**3.02 TESTING OF GROUNDING SYSTEM**

- A. Testing of grounding systems and made ground electrodes will be performed by an approved testing contractor and shall be part of this contract. See Section 26 0820 Testing of Electrical Systems for complete testing and reporting requirements.

**3.03 MISCELLANEOUS PROVISIONS**

- A. Provide bonding for miscellaneous metal, i.e.: Door frames, louvers, etc. See Details.

**END OF SECTION**

**SECTION 26 0533  
RACEWAYS FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Installation of raceway systems for all work in Electrical Division and required fittings.

**PART 2 - PRODUCTS**

- A. Rigid galvanized steel conduit to conform to ASA Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading. Conduits manufactured by Republic, Wheatland, Southwire, Clifton, Triangle, or Walker.
1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings not allowed.
  2. Terminate rigid conduit with two locknuts, one inside, one outside of the cabinet, junction or outlet and a bushing. Bushing - malleable iron with smooth bakelite ring molded into edge of bushing to prevent damage to cable, OZ Mfg. Co., type "B" or approved equivalent. Where grounding bushings are required, construction of bushing similar to above except a lug provided for grounding connection, OZ type "BLG" or approved equivalent.
- B. Rigid intermediate grade conduit, IMC, to conform to UL Standard No. 1242; hot dipped galvanized or approved equivalent. Manufactured by Allied, Southwire, or ETP.
1. All fittings, ells, couplings, etc., constructed to same standards as rigid steel conduit. Fittings - threaded type with all threads engaged. Use "Uni-swivel" couplings in dry locations only.
  2. Conduit terminations same as rigid steel conduit.
- C. Flexible steel conduit, "Greenfield", continuous spiral wound and inter-locked, threadless, galvanized conforming to U.L. and CSA Standards for flexible steel conduit; manufactured by National Electrical Products or International Metal Hose Company.
1. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means, Thomas & Betts, Efcor, Midwest, Appleton, Racor, Steel City, or ETP.
  2. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket, as manufactured by Anaconda "Sealtite" or Robroy - "Flex".
    - a. Fitting Assembly - sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means. Fittings - Thomas & Betts, Efcor, Midwest, Appleton, Racor, Steel City or ETP.
  3. Aluminum rigid conduit to conform to UL standard No. 6 for rigid metal conduit, as manufactured by Kaiser or Alcoa. s
    - a. Use aluminum fittings, except use steel locknuts. Join and terminate similar to rigid steel conduit. Lubricate all joints with compound.
  4. Electrical metallic tubing, EMT, threadless, steel type conforming to ASA Standard C80.3 galvanized inside and out, and with additional corrosion resistant finish. EMT manufactured



- by Republic, Wheatland, Pittsburgh Standard, Southwire, Clifton, Spang-Chalfont, Triangle, Walker, or ETP.
- a. Fittings, connectors, couplings, etc., insulated throat galvanized steel, raintight, compression type; Thomas & Betts, Efcor, ETP, Midwest, Raco, Appleton, or Steel City.
5. Plastic conduit, PVC, polyvinyl chloride compound, rated for direct burial, Schedule 40, except as noted otherwise, manufactured by Carlon, Sedco, ETP, Can-Tex or approved equivalent.
- a. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.
6. Type EB - encased burial duct: Polyvinyl chloride compound conforming to NEMA Standard TC-6, UL listed and designed for encased burial use, manufactured by Carlon Type "EB", Sedco "EB", ETP "EB", Can-Tex "EB" or approved equivalent.
- a. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install conduit as follows:
1. Use rigid steel or intermediate grade conduit for:
    - a. Circuits run underground.
    - b. Circuits run in concrete in contact with earth.
    - c. Circuits in hazardous locations.
    - d. Circuits exposed to mechanical damage.
    - e. All feeders exposed to moisture or outside.
    - f. All motor circuits.
  2. Use rigid Aluminum Conduit for:
    - a. Feeders overhead in dry locations (where shown).
    - b. All 400 cycle feeders and branches.
    - c. Where shown on drawings.
  3. Use electrical metallic tubing, EMT, for:
    - a. Branch circuits in dry locations.
    - b. Telephone circuits.
    - c. Auxiliary systems and controls.
    - d. Feeders run overhead in dry locations.
    - e. Branch circuits in concrete slab.
  4. PVC conduit for:
    - a. Individual ground wires.
    - b. Circuits run underground where indicated.
    - c. Where specifically shown on drawings.

- 5. Use type EB conduit for exterior concrete encased application where shown.
- B. Size conduit per NEC. Minimum size 1/2" diameter, but no more than 3#12 installed in 1/2" conduit.
- C. Run conduit concealed where possible. Run concealed conduit above furred ceiling in an orderly manner. Multiple conduits grouped and run parallel.
- D. In concrete slab: Install conduits in center of concrete slabs and tie to reinforcing steel with tie wires. Do not install conduit larger than 1" in concrete slabs unless approved by [Architect (or) Engineer]. Install with minimum of 2" between parallel runs. Do not cross conduits in slab unless necessary, then only one conduit crossover in 12" space.
- E. Exposed Conduit: Use only where specifically shown or approved. Run perpendicular to building walls and partitions and tight against structure. Conceal vertical portion of conduits where possible.
- F. Paint underground metal conduit with 2 coats of asphaltum or bituminous. Make underground conduit fittings watertight using Teflon tape. Do not use split couplings and similar fittings underground and exposed to moisture. Run underground conduits minimum 24" below grade. Do not run conduit in slag fill.
- G. Paint conduit fittings and threads exposed to moisture with Rustoleum silver paint after installation.
- H. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6 times conduit diameter or 6" whichever is greater. Bend IMC conduit without deforming.
- I. Where conduit crosses expansion joints, install expansion type fittings OZ type EX with bonding jumper or approved equivalent.
- J. Make connections to equipment away from wall with conduit extensions exposed from ceiling to floor, anchored with floor flange and/or angle frame as required. Make connections to equipment with flexible conduit from tee conduit in conduit riser.
- K. Vibrating equipment and equipment requiring adjustment, i.e.: motors, transformers, etc.: make final connections with flexible conduit.
- L. Isolate conduit connections to equipment on roof from roof penetration of conduit with short section of flexible conduit between roof penetration and equipment.
- M. Use liquidtight flexible conduit where exposed to moisture, oil, etc.
- N. Install conduit to avoid hot water pipes. Maintain 9" clearance of such pipes unless closer crossings are unavoidable. Maintain minimum 1" clearance from covering of pipe crossed.
- O. Support conduit per NEC. Support individual conduits with galvanized hangers and rods as follows:

1" diameter and smaller .....	1/4" dia. rod.
1-1/4" to 3" diameter .....	3/8" dia. rod.
Larger than 3" diameter .....	1/2" dia. rod.

- P. Individual conduit hangers - Minnerallac, or approved equivalent. Support EMT near each joint. Support for multiple conduit runs consist of Unistrut channel as required with 1/2" diameter galvanized bolts or rods anchored to structure. Provide "U" bolt clamps for each conduit on hangers. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduit to ceiling support system.
- Q. Terminate conduits entering sheet metal boxes with double locknuts and bushings. Terminate conduit exposed to moisture with watertight hubs.
- R. Where ground conductor installed in conduits 1-1/4" and larger provide grounding bushings, and bond full size ground wire to bushings and from bushing to box or cabinet. Bond with self-tapping screw and appropriate lug. Where ground wires are run in smaller conduits, bond to outlet and junction boxes with self-tapping screw lug. Provide other conduits with non-grounding bushings as described under another article. Provide all service entrance metallic raceways with grounding bushing and bond to ground bus; bond sized per table 250-94c N.E.C.
- S. Install aluminum conduit using "No-OXID-A" compound (Dearborn Chemical Company) on all threads.
- T. Conduit work in hazardous areas, or areas with large temperature differential: Use rigid steel or IMC conduit with sealing fittings, poured with hardening compound after conductors are pulled-in. Seals installed per NEC. Conduit seals Crouse-Hinds type EYS or approved equivalent.
- U. PVC Conduit Installation:
1. Above ground: Allow for expansion and contraction.
  2. Below grade: Encase in 3" sand fill. Backfill free of large rocks and debris.
  3. Make elbows, bends, etc., with heated bender when factory bends are not available.
  4. Make cuts with hacksaw and deburr ends.
  5. Make joints as follows:
    - a. Clean outside of conduit to depth of socket, and inside of socket with approved cleaner. Apply solvent cement to interior of socket and exterior of conduit, insert conduit in socket and rotate 1/4 to 1/2 turn and allow to dry.
  6. Where non-metallic conduit is used for power wiring install insulated ground wire, sized per NEC unless shown larger.
- V. Sleeves:
1. Provide sleeves for all raceways 1-1/4" and larger penetrating floors, structural members, or walls. Sleeves consist of Electrical Metallic Tubing set in forms. (Exception: Use Schedule 40 PVC for individual ground conductors).
  2. Size sleeves to allow 1/2" clearance around raceway extending from bottom of floor construction to 2" above floor, minimum sleeve size 2-1/2" diameter.
  3. After raceways are installed, seal space between the raceway and sleeve with non-hardening, fireproof, compound, 3M Firestop System.

## W. Concrete encased duct banks:

1. Lay duct lines to a minimum grade of 4" per 100 feet slope toward pad or vault.
  - a. Terminate at pad or vault with end bells.
  - b. Make changes in direction of runs using couplings or bends manufactured for purpose.
  - c. Install duct lines so top of concrete is minimum 36" below finished grade or paving.
2. Clean conduit before laying and plug ends during construction to keep conduits clean.
3. After duct line is completed, pull 12" long mandrel, having a cross-section 1/4" less than conduit, through each conduit. After mandrelling, pull brush with stiff bristles and swabs through to remove particles of earth, sand or gravel.
4. Encase each conduit in concrete as indicated on drawings. Thickness of concrete encasement shown is minimum and may be increased to fit actual shape of trench.
5. Use concrete or PVC spacing blocks 5'-0" on center maximum and anchor to earth with adequate rebar and wire straps to avoid movement during concrete pour.
6. Stagger joints in conduits 6".
7. Anchor ducts to prevent movement during placement of concrete.
8. Use plain concrete except where reinforced concrete is specified or indicated.
9. Use monolithic concrete construction. Where connection is made to existing duct line bond concrete encasement to existing encasement with 1/2" dowels set 12" into each side of concrete joint.

**END OF SECTION**

**SECTION 26 0534  
OUTLET BOXES, JUNCTION BOXES, WIRING BODIES, AND WIRING GUTTERS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK:**

- A. Outlet boxes, floor boxes, pull and junction boxes, conduit bodies, wiring gutters and their installation.

**1.02 RELATED WORK**

- A. Section 26 0533 – Raceways for Electrical Systems
- B. Section 26 0535 – Switches and Receptacles

**1.03 SUBMITTALS**

- A. Produce Data for outlet boxes, junction boxes, wiring bodies and wiring gutters showing configurations, finishes, dimensions, and manufacturer's instructions.

**1.04 STANDARDS**

- A. ASTM No. E119.
- B. NEC Article No. 370
- C. ASTM A 386
- D. UL NO. 5

**PART 2 - PRODUCTS****2.01 OUTLET BOXES:**

- A. Provide wiring devices, fixtures and special system devices with outlet box. Use galvanized steel boxes conforming to UL Standard 514A for concealed in dry locations. All boxes shall have matching cover plates except switches and receptacles, see Section 26 05 34. Welded boxes are not acceptable.
- B. Use galvanized or equivalent coated cast iron conduit fittings, and conduit bodies with threaded hubs for exposed boxes outside, and outlet boxes exposed to moisture.
- C. Use 1/16" thick steel boxes and covers of form and dimension adapted to its specific use and location, kind of fixture or device to be used and number, size and arrangement of connecting conduits and number of wires in outlet, all in accordance with NEC.
- D. Provide 3/8" fixture studs where required for hanging or mounting fixtures.
- E. Ceiling Outlet Boxes: 4" octagonal or 4-11/16" square as required, due to number of wires, and 2 1/8" deep minimum. Ceiling boxes in concrete slabs shall be UL listed for embedding in concrete. Plaster rings not required for ceiling outlet unless needed for device.
- F. Paint junction boxes provided with blank covers to match surroundings, except use plaster rings and blank device plates in finished areas.

- G. Concealed switch and receptacle outlet boxes: 4" square with plaster rings as necessary. Provide multi-gang boxes where shown or required. Provide metal barriers to separate emergency and normal service wiring per NEC. 4" x 2 1/8" x 2 1/8" boxes may be used for single receptacle or switch devices. Where more than two (2) devices are shown used 4" H x 2 1/8" D x number of gangs x (2 1/8" w.) and with barriers as required per NEC. Provide box with grounding screw and connections as required by wiring method.
- H. Use rectangular galvanized cast iron boxes, size (number of gangs) and number of conduit hubs as required, type "FS" conduit bodies with appropriate covers for wall switch and outlet devices in exposed interior or exterior conduit work and exposed to moisture. Provide gasket cover plates for all boxes used in wet location.
- I. Use round galvanized cast iron boxes size and number of conduit hubs as required for ceiling outlets in exposed conduit work exposed to moisture.
- J. Use shallow boxes on all furred walls.
- K. Acceptable Manufacturers

Steel City  
Raco  
Appleton

## 2.02 LARGE PULL AND JUNCTION BOXES:

- A. Furnish pull, tap, and cable support boxes required by NEC for excessive number of 90 degree conduit bends, conductor taps, and cable supports.
- B. Box construction per NEC and conforming to UL Standard No. 50, and manufactured with galvanized sheet steel, 12 gage minimum, with angle iron frame where required for rigidity; welded or bolted construction is acceptable. Install bolts to prevent damage to cables in box.
- C. Boxes with removable screw type covers and plated screws. Provide split covers where necessary for access. Maximum single piece cover - 36" x 36".
- D. Provide separate junction boxes for each feeder. If conduit is installed so separate junction boxes are not practical, one large pull-box may be used with each set of feeder conductors separated by 12 gage steel barriers. Furnish junction box or each compartment in junction box with ground lug for connection of ground wire.
- E. Boxes located in damp or wet locations shall be welded construction and finished white inside and gray outside with waterproof paint. Provide gasketed door and corners. Provide rain drip shields. Boxes shall carry NEMA 3R (weatherproof) or NEMA 4 (watertight) labels as specified.
- F. Acceptable Manufacturers:

Hoffman  
Keystone  
Burns

## 2.03 CONDUIT BODIES:

- A. Conduit bodies shall be installed to provide ease of pulling conductors and to provide neat appearance of conduit installation, and as shown on drawings. Conduit bodies constructed of malleable iron or copper free aluminum castings. Bodies shall be finished with standard durable exterior coatings of manufacturer specified. Provide rollers in type "C" and type "LB" bodies,

1-1/4" size and larger. Provide gasketed plated steel or malleable iron covers.

- B. Provide screws-in type blanking caps for all open conduit entrance.
- C. Acceptable Conduit Body Manufacturers:

Crouse-Hinds  
Killark  
Pyle National  
Appleton

#### 2.04 GUTTERS (WIREWAYS):

- A. 8" x 8" and smaller - use standard assembly consisting of code gage galvanized or painted steel and combination hinged/screw covers. Make special and larger gutters of code grade galvanized sheet steel with combination hinged/screw covers and approved fastening device.
- B. Acceptable Wiring Gutter Manufacturers

Square D  
B&C Stamping Co.  
General Electric  
Walker Electric

#### 2.05 SURFACE METAL RACEWAYS:

- A. Where indicated on the drawings, wiring shall be run in exposed metal raceways, complete with outlet boxes and fittings. All circuits run in surface metal raceways shall have a ground conductor with green insulation sized per the NEC, but not smaller than No. 12 AWG screw connected to each outlet box. All wiring in surface metal raceways shall be type "THWN-2" conductors.
- B. Acceptable Surface Raceway Manufacturers

Wiremold  
Panduit

### PART 3 - EXECUTION

#### 3.01 IDENTIFICATION:

See Section 26 05 53 – Identification for Electrical Systems for the requirements for identifying the equipment in this Section.

#### 3.02 INSTALLATION OF OUTLET BOXES:

- A. Fasten outlet boxes securely to structure.
- B. **Where any type electrical box or enclosure penetrates or is concealed within a fire rated wall, provide external or internal fire proofing and increased box sizes as required to maintain wall rating and as approved by local AHJ.**
- C. Set all flush outlet boxes so edge of device flange is flush with finished surface. Provide extension rings where required.
- D. Open no more knockouts in outlet box than required.

- E. Seal boxes during construction to prevent entrance of construction debris.
- F. Stagger back to back boxes 3" minimum.
- G. Support All Boxes:
  - 1. Outlet boxes - with 1/4" diameter galvanized rods or bolts anchored to structure.
  - 2. Outlet boxes for surface mounted luminaires on furred ceilings with 3/4" channel iron fastened to ceiling channels. See Section covering "Luminaires".
  - 3. Pull, junction and cable boxes with 3/8" diameter galvanized rods or bolts (4 minimum).
  - 4. Support outlet boxes in steel stud partitions with bar hangers or approved equivalent. Hangers must provide substantial support and rigidity before wall finish, i.e.: sheet rock, plaster, etc. is applied.
- H. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.
- I. Install adjacent outlets at different levels in one vertical line where possible.
- J. Provide green covered bonding jumper, screw connected to outlet box in all receptacle boxes.
- K. Paint wiring connections in ground mounted outlets or floor outlets in wet locations with "Scotchkote" and fill box with "Duxseal".
- L. Mark outlet box covers with permanent ink markers to indicate circuit number(s) and panel of origination. Use black markers for normal service circuits and orange for emergency service. Paint all fire alarm system box covers red and mark "FA".
- M. Install conduit bodies where shown or where required for sharp bends and/or aesthetics in raceway system. Do not use in lieu of pullboxes except in limited space or as directed by Consultant.
- N. In "Fire Rated" partitions, boxes shall comply with ASTM Standard No. E119.

### **3.03 INSTALLATION OF GUTTERS (WIREWAYS):**

- A. Mount gutters on 3/4" thick fire retardant plywood backboard, sized for devices to be mounted, 2 coats of Albi No. 107A fire retardant paint or accepted equivalent by Sherwin Williams, or Indurall, (install Class A fire label on board), mount all equipment thereon.
- B. Run conductors in gutter without reduction in size, entire length of gutter. Connect parallel phase conductors to feed together at end of run with tap/splice connector.

**END OF SECTION**



**SECTION 26 0535  
SWITCHES AND RECEPTACLES**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK:**

- A. Wiring devices, plates, and installation.

**1.02 SUBMITTAL**

- A. Provide product data and sample of each product specified in this section.

**PART 2 - PRODUCTS****2.01 DEVICES:**

- A. Furnish and install devices and associated device plates shown on drawings. Catalog numbers shown establish a standard of quality.
- B. Receptacles, Straight-Blade and Locking Type: Except as otherwise indicated, comply with Federal Specification W-C-596 and heavy-duty grade of UL Standard 498, "Electrical Attachment Plugs and Receptacles."
- C. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements.
- D. Ground-Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters," feed-through type, with integral NEMA 5-20R duplex receptacle arranged to protect connected downstream receptacles on the same circuit. Design units for installation in a 2-3/4 inch deep outlet box without an adapter.
- E. Pendant Cord/Connector Devices: Matching, locking type, plug and plug receptacle body connector, NEMA L5-20P and L5-20R, heavy-duty grade.
- F. Bodies: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
- G. External Cable Grip: Woven wire mesh type made of high-strength galvanized-steel wire strand and matched to cable diameter and with attachment provision designed for the corresponding connector.
- H. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.
- I. Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor has green insulation. Ampacity is equipment rating plus 30 percent minimum.
- J. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.
- K. Snap Switches: Quiet-type A.C. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches", and with Federal Specification W-S-896.

## L. Acceptable wiring device manufacturers:

Pass and Seymore/Legrand  
Arrow Hart  
Hubbell  
Leviton  
General Electric  
Daniel Woodhead

## M. Submit list of devices with catalog number proposed for review prior to ordering.

## N. Use color selected by Architect. Furnish color chart for selection.

1. Colors selected from standard available of either white, brown, black, gray or beige.

**2.02 DEVICE PLATES:**

- A. Furnish devices with 0.4" thick Type 302 stainless steel brushed finish cover plates.
- B. Wall plates for devices in flush boxes, unless specified otherwise, shall be .040" thick beveled edge Type 302 stainless steel brushed finish plates, single or multi-gang as required by the outlet. Plates for FS or FD type boxes shall be zinc or cadmium plated sheet steel, specially designed to fit the type of outlet box. Blank plates shall be furnished and installed on all empty, blanked or unused outlets.
- C. Device plates manufactured by device manufacturer where available.
- D. Furnish configuration of device plates required for multi-gang installations.
- E. Furnish weatherproof devices with individual gasketed stainless steel covers manufactured by device manufacturer.
- F. Plate-Securing Screws: Colored to match plate finish.

**2.03 MULTI-OUTLET ASSEMBLIES:**

- A. Comply with Standard UL 5 "Surface Metal Raceways and Fittings".
- B. Components of Assemblies: Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard corrosion-resistant finish.
- D. Wire: No. 12 AWG.
- E. Acceptable Manufacturer:
  - Wiremold G-3000 Series
  - Equal by Isoduct
  - Equal by Hubbell
- F. Use only where approved by Manufacturer

**PART 3 - EXECUTION****3.01 INSTALLATION:**

- A. Install receptacles with ground wire from ground screw connected to outlet box.
- B. Install devices vertical 48" AFF for switches and 18" AFF for receptacles unless shown otherwise. Devices shall be installed plumb and secure on all sides.
- C. Install receptacles with ground slot down.
- D. Match devices to plug connectors for Owner-furnished equipment. Verify type, configuration, etc., prior to providing devices. Including all such costs in bid submission.
- E. Match cord and plug sets to equipment requirements.

**3.02 IDENTIFICATION:**

- A. Comply with Division 26, Section 26 0553 – Identification for Electrical Systems.
- B. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.
- C. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

**3.03 GROUNDING:**

- A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of electrical system.

**3.04 FIELD QUALITY CONTROL:**

- A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.
- B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.
- C. Replace damaged or defective components.

**3.05 CLEANING**

- A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

**END OF SECTION**

**SECTION 26 0543.16  
EXCAVATING FOR ELECTRICAL**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. The extent of excavating and backfill work includes excavating and backfilling to install work specified herein.
- B. Work requiring excavation and backfill includes but is not limited to:
  - 1. Underground wiring and raceways.

**1.02 JOB CONDITIONS**

- A. Locate and protect existing utilities and other underground work to prevent damage or service interruption.
- B. Protect property from damage which might result from excavating, backfilling and resulting erosion. Provide sheet shoring for all excavation.
- C. Protect persons from injury at excavations, by barricades, warnings and illumination.
- D. Coordinate work with weather conditions, to minimize damage and hazard.
- E. Provide temporary enclosure and heat necessary to protect bottoms of excavations from freezing. Do not install work on frozen excavation.
- F. Maintain proper clearances from existing utilities and other underground work.

**PART 2 - PRODUCTS****2.01 BACKFILL MATERIALS**

- A. Backfill Material: Soil material suitable for compacting to required densities.

**PART 3 - EXECUTION****3.01 EXCAVATING**

- A. Work must comply with the National Electrical Safety Code.
- B. Examine areas to be excavated, and conditions under which work is to be performed.
- C. Excavate with vertical-sided excavations where possible. Provide sheeting and cross-bracing. Remove sheeting and cross bracing during backfilling where removal would not endanger the work. Where not removed, cut sheeting below grade to avoid interference with other work.
- D. Excavate for conduit with 9"± clearance each side of conduit. Excavate for other electrical work to provide adequate working clearances.
- E. For work supported on undisturbed soil, excavate to required depths. Hand-excavate bottom to accurate elevations. Support following work on undisturbed soil:

1. Single conduits of 5" and less nominal size.
  2. Cast-in-place concrete or concrete cast assemblies.
  3. Flat-bottomed multiple-duct conduit units.
- F. Where sub-base material is indicated, excavate for depth indicated.
- G. Excavate additional depth as directed to reach satisfactory soil-bearing. Backfill with sub-base material, compacted as directed.
- H. Excavate within drip line of trees by hand. Protect root system from damage or dryout. Do not cut roots. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts with asphaltic tree paint.
- I. No blasting is allowed unless accepted in writing by Consultant. Consultant will review methods for removing rock.
- J. Store excavated material near excavation. Do not store under trees.
- K. Retain excavated material meeting backfill requirements.
- L. Remove excess excavated material from site.

### **3.02 ROCK EXCAVATION**

- A. Rock excavation consists of removal and disposal of materials encountered that cannot be excavated with a 3/4 cubic yard capacity power shovel without drilling and blasting, or requiring use of special equipment, except such materials that are classified as earth excavation.
1. Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
  2. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
- B. Rock payment lines are limited to the following:
1. Two feet outside of concrete work for which forms are required except footings.
  2. One foot outside of perimeter of footings.
  3. In pipe trenches, 6" below invert elevation of pipe and 2 ft. wider than inside diameter of pipe, but not less than 3 ft. minimum trench width.
  4. Neat outside dimensions of concrete work where no forms are required.
  5. Under slabs on grade, 6" below bottom of concrete slab.
- C. Excavate rock with track hole hammer drill as required.

### **3.02 DEWATERING**

- A. Maintain dry excavations. Protect from surface water. Pump water from excavations.

- B. Difficult excavation dewatering such as well point systems, etc., are not included in the contract unless specifically noted. If consultant deems this type of dewatering is necessary, the cost of the special dewatering system will be cause for change order to contract.

### **3.03 BACKFILLING**

- A. Backfill excavations with suitable material.
- B. Condition backfill material for compacting by drying or adding water as required. Do not backfill with frozen materials.
- C. Backfill excavations carefully. Do not dislocate the work.
- D. Backfill excavations in 12" loose lifts to 95% density in on grade areas and 100% in paved areas.
- E. Backfill to adjacent grades.
- F. Where concrete occurs under pavement, backfill to level beneath existing concrete, dowel new layer of concrete into existing, thickness and type to match existing.
- G. Compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material. Do not settle backfill with water.
- H. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore surface to grade and compaction indicated on the drawings, mounded over and smoothed off.

### **3.04 PERFORMANCE AND MAINTENANCE**

- A. Where subsidence is measurable or observable at excavations during warranty period, remove surface and backfill material, compact, and replace surface treatment to match adjacent work.

### **3.05 EXISTING UTILITIES**

- A. The Contractor is responsible to employ a Professional Surveyor to layout and stake all existing utilities which appear to conflict with new underground work and excavation.
- B. Before starting excavation, this Contractor is responsible for contacting local utilities, i.e.: Telephone Company, Gas Company, Water Works, Power Company, Cable TV Company, Sewage and Drainage Agency, and any other utility company showing evidence of being in the area of excavation. These utilities shall have their respective personnel locate and stake underground utilities to avoid cutting any.
- C. This Contractor is responsible for maintaining stakes indicating lines. Record location of staked lines on "Record" drawings.
- D. Use hand excavation in areas where existing Utilities occur.
- E. Where existing utility circuits, piping, ducts, etc., are damaged, this Contractor shall be responsible to have damaged utility repaired to satisfaction of Consultant and the Utility Company. No repaired utility shall be covered until accepted by the Utility Company involved and/or Consultant. The Contractor shall not repair communication circuits. Only the involved utility shall repair these circuits. Any charges for repair of these circuits by the utilities shall be paid by the Contractor directly to the utility involved and shall not be the basis for change order.

- F. Existing utility lines shown on drawings are taken from all available drawings and subsurface information available. Exercise extreme care in excavation to avoid existing utilities. Where existing utilities are not as shown record locations and depths on "Record" drawings.

### **3.06 PLANTING AND RESODDING**

- A. Where existing grass sod is cut, Contractor shall remove with care and store to prevent dying. Keep stored sod moist. After excavation and backfill, replant sod and fertilize, water, etc., to assure continued growth. If sod dies within one year of substantial completion of contract, replace sod with new sod to match existing.
- B. Where existing grass plot is not sodded, seed top of backfill with mixture Kentucky #1 Fescue grass seed and Rye locally available similar grass seed to hold soil. Fertilize for proper growth.
- C. Where excavation requires removal of small trees, shrubs, and plants, remove plants with ball of dirt adequate to cover roots and store with burlap bag around ball. Keep ball moist. After excavating and backfill, replant material in same location of removal. Replace any material which dies as a result from this excavation within guarantee period.
- D. Replace any ground cover (crushed stone, pine bark chips, pine straw, etc.) affected by this excavation.

**END OF SECTION**

**SECTION 26 0553  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide and install required identification for the systems and equipment shown on the drawings and/or specified. The extent of identification is specified herein and in individual technical sections of work.
- B. Coordinate with Consultant and Owner for proper equipment identification nomenclature. Nameplates must be approved by Consultant prior to ordering and installation.
- C. Types of electrical identification include:
  - 1. Conduit labeling.
  - 2. Buried cable and conduit warnings.
  - 3. Cable/conductor identification.
  - 4. Operational instructions and warnings.
  - 5. Danger signs.
  - 6. Equipment/system identification labels, signs, and nameplates.
  - 7. Equipment/system Mimic Bus.
  - 8. Egress lighting fixtures.
  - 9. Device labeling/nameplates.
  - 10. Junction box labeling.

**1.02 SUBMITTALS**

- A. Manufacturer's Data:
  - 1. Product specifications and installation instructions for each material and device.
- B. Samples:
  - 1. Provide for each color, lettering style and other graphic representation.
- C. Labels:
  - 1. Provide a list of labels with actual designations as they will be printed.

**PART 2 - PRODUCTS****2.01 ELECTRICAL IDENTIFICATION MATERIAL**

- A. Conform to ANSI A13.1, Table 3 for minimum size of legend letters and minimum length of color field for each raceway or cable size. Use colors prescribed by ANSI A13.7, NFPA 70 and these specifications.



**B. Color-Coded Conduit Markers:**

1. Standard preprinted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits. Attach with adhesive, adhesive lap joint of marker, matching adhesive plastic tape at each end of marker, or pretensioned snap-on. Lettering to indicate voltage, function of conductors in conduit and shall be 8" minimum length.
2. Colors: For Low Voltage provide per Governing Codes and refer to Part 3, Execution.

**C. Color-Coded Plastic Tape:**

1. Manufacturer's standard self-adhesive vinyl tape, minimum 3 mils thick by 1-1/2" wide.
2. Color: Refer to 26 05 19 Conductors and Governing Codes.

**D. Underground Plastic Line Marker:**

1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, for direct-burial service; minimum 6" wide x 4 mils thick. Printing to indicate type service of cable with large (minimum 2-1/2") high black letters.
2. Color: Red with black lettering

**E. Cable/Conductor Identification Bands:**

1. Manufacturer's standard vinyl self-adhesive self-laminating cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification. Similar to Panduit "Instacode" or accepted equivalent by T&B, or Tyton.

**F. Self-Adhesive Plastic Signs:**

1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application.
2. Color: Refer to Governing Codes.

**G. Danger Signs:**

1. Manufacturer's standard "DANGER" signs, baked enamel finish on 20 gage steel; standard red, black and white graphics; 14" x 10" unless 10" x 7" is largest which can be applied, or where larger size is needed for visibility use recognized explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH, DANGER-STARTS AUTOMATICALLY). Colors per Governing Codes.

**H. Engraved Signs (Nameplates):**

1. Use 1/8" thick melamine plastic laminate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum). Punched for screws.
2. Fasteners: Self-tapping stainless steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.

## I. Mimic Bus:

1. The Mimic bus should be colored hard plastic phenolic bakelite strips anchored with brads or screws and epoxy adhesive. Minimum mimic bus size shall be 1/32" thick x 1" wide.

## J. Lettering and Graphics:

1. Coordinate names, abbreviations and other designations used with those shown or specified. Provide numbers, lettering, and wording as indicated or required for identification and operation/maintenance.

## K. Emergency Lighting Fixtures:

1. Use 1/8" thick melamine plastic nameplate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum). Punch for screws.
2. Color: Yellow field, blue letters.

## L. Device Labeling:

1. Tape labels on device plate for switches and receptacles outlets identifying branch circuit and panel designation.

**PART 3 - EXECUTION****3.01 APPLICATION AND INSTALLATION**

## A. General Installation Requirements:

1. Install after completion of painting.
2. Comply with governing regulations and requests of governing authorities for identification of electrical work.

## B. Conduit Identification:

1. Use adhesive marking tape labels, Brother or Kroy labels 1" high x 12" long (min.), at 10 foot intervals and within 3 feet of equipment to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible. Labels for multiple conduits shall be aligned. Use the following colors:
  - a. 600 Volt and Below Normal/Commercial: White letters on black background indicating feeder identification and voltage.
  - b. 600 Volt and Below Emergency/Alternator/Generator: White letters on red background indicating feeder identification and voltage.
  - c. 600 Volt and Below UPS: Black letters on yellow background indicating feeder identifications, circuit number and voltage.
  - d. Fire Alarm: Red letters on white background indicating "FIRE ALARM".
  - e. Temperature Control: White letters on blue background indicating "TEMP. CONTROL."

- f. Ground: White letters on green background indicating "GROUND" and equipment and designation.
  - g. Building Alarms: Orange letters on white background indicating "BUILDING ALARMS."
  - h. Network Fiber: Black letters on white background indicating "NETWORK FIBER."
2. Coordinate with Owner/Engineer prior to submittals and include facility color scheme if different or as directed to satisfaction of Owner/Engineer.
  3. Where conduits enter or exit a panelboard, pull or junction box, switchboard, or other distribution equipment, conduit labels shall be installed within 3 feet.
  4. For overhead conduits, place identification such that it can be read standing on the floor below.
- C. Underground Cable Identification:
1. During back-filling of underground cable, install continuous underground marker, directly over buried line 6" to 8" below finished grade. Where multiple lines are buried in common trench not exceeding 24" width, install a single line marker. Install additional line markers for each increment of 24" width, i.e., 36" wide trench - 2 markers: 54" wide trench, 3 markers. Install multiple markers evenly spaced.
  2. Install line marker for every buried ductbank and/or conduits.
- D. Operational Identification and Warnings:
1. Provide operational signs for:
    - a. Switchgear
    - b. Automated breakers
    - c. Transfer switches
    - d. Large motor starters
    - e. Engine-generator
    - f. All rotating equipment
- E. Danger Signs:
1. Provide for engine generators and other automatic equipment, i.e.: "Danger-Starts Automatically".
  2. Provide as required by codes.
- F. Engraved Plastic Laminated Signs:
1. Install on each major unit of electrical equipment in the building. Provide text 1/4" high lettering on 1" high sign. Matching terminology and numbering as indicated in contract documents.
  2. Provide signs for each unit of the following categories:

- a. Electrical cabinets and enclosures. Indicate cabinet designation, voltage, phase and feeder origin.
  - b. Access panel/doors to electrical facilities. Indicate room name and use.
  - c. Major electrical switchgear. Indicate equipment designation, voltage, phase and feeder origin.
  - d. Electrical substations. Indicate equipment designation, voltage, phase and feeder origin.
  - e. Safety switches, circuit breakers and portable engine disconnects. Indicate equipment designation, voltage, phase and feeder origin.
  - f. Transformers. Indicate transformer designation, voltages, phases and feeder origin and equipment served.
  - g. Feeder cables inside pull and junction boxes and inside all switchgear at terminals indicating source and destination. Fasten with nylon ties.
  - h. All equipment furnished in this Division of the specifications. Indicate equipment designation, voltage, phase and feeder origin.
  - i. Junction, Pull and Connection Boxes. Identification of systems and circuits shall indicate system voltage and identity of contained circuits on outside of box cover. Color code shall be same as conduits for pressure sensitive labels. Use self-adhesive marking tape labels at exposed locations and indelible black marker at concealed boxes.
  - j. All fire alarm boxes shall have covers painted red with black "FA" stenciled on cover. All temperature control boxes shall have covers painted blue.
  - k. Emergency and Egress lighting.
  - l. All grounding system equipment and conductors.
- G. Mimic Bus:
1. Provide a mimic bus on front of switchboards to indicate connections as follows:  
green – commercial; yellow – alternator/generator supply; red – essential load bus;  
orange – uninterruptable power supply (UPS).
  2. Secure each section with minimum two cadmium-plated screws.
- H. Install all signs where indicated or most visible. Secure all signs with at least two cadmium-plated screws. Where substrate cannot receive screws, refer to Engineer.
- I. Identify all conduits installed for future use.

**END OF SECTION**

**SECTION 26 0820  
TESTING OF ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK:**

- A. Provide instruments, power supplies, trained technicians, all connections, and labor to test electrical equipment as specified herein, and in Technical Sections contained in this specification referring to test procedures and/or standards listed and specified below.
- B. **A minimum 4 week written notice to Engineer shall be submitted, along with the step by step testing procedure and MOP for review and approval. See Electrical item specific, General, and Submittal Sections for additional requirements and notification.**
- C. **Test all equipment/connectors/etc. at manufacturer recommended values unless values are provided in this testing document. In the absence of test values use NETA Standard acceptance testing values.**
- D. **Provide handwritten test reports immediately after testing to Engineer for review prior to placing equipment/connectors/etc. into service.**
- E. **If deviations or abnormal conditions or values are found, notify Engineer immediately after testing and do not place equipment into service.**

**1.02 SUGGESTED DIVISION OF RESPONSIBILITIES:**

- A. This specification requires **all** electrical equipment to be tested and the associated Testing Form completed, submitted to Electrical Consultant/Owner for review and approval prior to placing equipment into service. It is recommended that the Electrical Contractor perform **all insulation resistance testing only** and inspection and complete NETA test forms for all 600 Volt and less rated conductors and equipment busses as the equipment is installed. Below is a list of equipment recommended to be (insulation resistance) tested by the Electrical Contractor which applies to only new or modified equipment.
  - 1. Low Voltage Switchgear and Switchboard assemblies
  - 2. Cables Low Voltage 600 Volt Maximum
  - 3. Busway
  - 4. Enclosed Switches and Breakers
  - 5. Panelboards
  - 6. Automatic Transfer Switches
- B. All required infrared testing for the above equipment shall be performed by separate testing contractor.
- C. **All other equipment (not listed above) as listed in scope of work (this section) shall be tested by an acceptable testing contractor as specified below.**
- D. Coordinate division of responsibility with testing contractor to ensure all equipment is tested and test forms are completed prior to energizing.

**1.03 QUALIFICATIONS OF TESTING CONTRACTOR:**

- A. Testing Contractor shall be normally engaged in the business of electrical testing with a minimum of 5 years' experience in specified tests. They shall have been qualified with Owner and be included on their current list of acceptable testing contractors.

- B. Test Contractor shall direct all testing technicians and contractor personnel in matters of testing safety and procedures.
- C. Submit qualifications to Test Contractor to Consultant for review 10 days prior to bid for review.
- D. Acceptable Testing Contractors:

BIC Switchgear Services, Birmingham, AL  
Fast Electric, Nashville, TN  
Industrial Electric, Jacksonville, FL  
Tru-Amp, Jackson, Miss.  
SETA, Charlotte, N.C.

- E. **Additional testing contractor shall be approved by Representative in writing and submitted to Engineer 10 days prior to bid date. Also, submit approval letter with bid.**

#### **1.04 TESTING STANDARDS:**

- A. NFPA - 70 B Electrical Equipment Maintenance.
- B. NETA - ATS-1995 Acceptance Testing Specification.
- C. IEEE Standards related to equipment to be tested.
- D. ANSI Standards related to equipment to be tested.
- E. National Electrical Safety Code.

#### **1.05 SCOPE OF WORK:**

- A. Provide NETA Test Form for all Equipment Tests required. Fill out all required Test Forms completely and include all requested information.
- B. Test all electrical equipment (new and/or existing and/or as identified). Specified testing shall be done in accordance with latest edition of NETA testing procedures, except as modified herein. Where no specification is included herein, obtain test values required by Test Forms using procedures outlined in latest edition NETA Acceptance Testing Specification.
- C. The following equipment and wiring shall be tested:
  - 1. Instrument Transformer
  - 2. Circuit Breaker Low Voltage Insulated Case and Molded Case
  - 3. Circuit Breaker Low Voltage Power (600 V Service)
  - 4. Metering and Instrumentation
  - 5. Grounding Systems
  - 6. Surge Protection Devices Low Voltage
  - 7. Automatic Transfer Switch
  - 8. Metering Service
  - 9. Infrared Thermography
  - 10. UPS & Inverter
  - 11. Generators

#### **1.06 COOPERATION:**

- A. Electrical Contractor shall assist Testing Contractor in performing following work:

1. Process Method of Procedures MOPs per General Conditions Specification Section.
2. Lockout and Tag-out equipment per MOP.
3. Prepare and disconnect equipment to be tested.
4. Remove and reinstall circuit breakers, relays, etc.
5. Inform manufacturers of new equipment as to testing schedule.
6. Install temporary wiring as required.
7. **Coordination with Utility to deenergize primary service feeder.**
8. Provide field label and or One Line Diagram (for new equipment) name plate info for all equipment to testing contractor to be included on test forms.

#### **1.07 RELATED WORK:**

- A. Section 26 0100 – Electrical General
- B. Section 26 0820 – Testing of Electrical Systems.
- C. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.
- D. Section 26 0526 – Grounding and Bonding for Electrical Systems.
- E. Section 26 2100 – Electrical Service Entrance
- F. Section 26 2211 – Dry Type Transformers
- G. Section 26 2300 – Switchgear
- H. Section 26 2513 – Plug-In Busway Systems
- I. Section 26 2516 – Cable Bus Systems
- J. Section 26 2800 – Enclosed Switches and Circuit Breakers.
- K. Section 26 3213.19 – Natural Gas Engine Driven Generator Sets
- L. Section 26 3623.16 – Automatic Transfer Switches Delayed Transition

#### **PART 2 - PRODUCTS - NOT USED**

#### **PART 3 - EXECUTION**

##### **3.01 TESTING ELECTRICAL SYSTEMS/EQUIPMENT:**

- A. Safety and Precautions:
  1. Safety practices shall include, but are not limited to, the following requirements:
    - a. Occupational Safety and Health Act of 1970-OSHA.

- b. Accident Prevention Manual for Industrial Operations, Seventh Edition, National Safety Council, Chapter 4.
  - c. Applicable State and Local safety operating procedures.
  - d. National Electrical Safety Code - NESC
  - e. NETA Safety/Accident Prevention Program.
  - f. Owner's safety practices.
  - g. National Fire Protection Association - NFPA 70E.
2. All tests shall be performed with apparatus de-energized except where otherwise specifically specified.
  3. The Switchgear Testing Contractor shall have a designated safety representative who shall be present on the project and supervise operations with respect to safety.
  4. Power Circuits shall have conductors shorted to ground by a hot-line grounding device approved for the purpose.
  5. In all cases, work shall not proceed until the safety representative has determined that it is safe to do so.
  6. The Switchgear Testing Contractor shall have available sufficient protective barriers and warning signs to conduct specified tests safely.

### **3.02 ELECTRICAL (600 VOLT) EQUIPMENT TEST:**

- A. Prior to acceptance for service, all existing and new service and distribution equipment, including transformers, switchboards, switchgear, panelboards, ATS, MCC, cables, breakers, busway, switches, UPS, controls, etc. shall be tested in accordance with specified procedures included herein.
- B. Tests will determine whether circuit breaker trip devices **100 amperes and larger** are functioning properly and correctly adjusted; contact surfaces and joints in switches and circuit breakers have minimum electrical resistance; all bolted connections are tight; bus bars are properly braced.
- C. Electrical Contractor shall assist Testing Contractor with testing, particularly in removing and reinstalling breakers and disconnect/reconnect conductors.
- D. Manufacturer of new equipment may be present to witness test and verify results for new devices and equipment.
- E. Tests shall not affect Contractor's guarantee of materials and workmanship. Contractor to replace defective new equipment and devices without additional cost to Owner. Replacement materials will be tested by same Testing Contractor making initial tests.

### **3.03 INSPECTION AND TEST PROCEDURES:**

- A. General Requirements:
  1. Visual and Mechanical Inspection:



- a. Inspect for physical damage.
  - b. Compare equipment nameplate information with latest single line diagram and report discrepancies.
  - c. Inspect for proper alignment, anchorage and grounding.
  - d. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instruction for proper foot pound levels. In the absence of specific instructions use Tables in NETA Appendix.
  - e. Inspect all bus bracing and insulators for tracking, broken parts, missing parts, etc.
  - f. Key electrical interlock systems shall be physically tested to insure proper function.
    - 1) Closure attempt to a dead bus shall be made on locked open devices. Opening attempt shall be made on locked closed devices.
    - 2) Key exchange shall be made with devices operated in off-normal positions.
  - g. All doors, panels and sections shall be inspected for paint, dents, scratches and fit with particular attention to correcting missing and loose bolts, bent hinges, broken or missing lock handles or latches and warped panels.
2. The interior of the switchgear must be kept clean and dry. Clean and vacuum all equipment included in the testing scope of work (except new equipment). Cleaning of new equipment is not required by testing Contractor unless specifically noted in Scope of Work. The presence of moisture and dirt is an extremely hazardous combination. The interior is not to be used for storage. Remove any stored materials.
  3. The availability of miscellaneous equipment and documents shall be checked. The items should include:
    - a. Switchgear shop drawings, schematics.
    - b. Rack-out devices.
    - c. Hoists.
    - d. Rubber Gloves.
    - e. Spare Control Fuse, and power fuses.
    - f. Spare Indicating Lamps.
    - g. Kirk keys.
  4. The items should be stored in a dedicated storage cabinet located near the switchgear.
  5. Devices such as meters and relays, as well as their associated wiring, should be thoroughly inspected. Check the wiring for physical damage - especially where subject to movement or the possibility of pinching. All wire terminations should be tight and free of corrosion. Similarly, fuses should be firmly secured in the clips and free of surface contamination. Indicating lights should be checked and burned-out bulbs replaced. All wires, terminals and devices should be labeled for proper identification.
  6. Meters should be tested for proper operation and inspected for cleanliness, tight terminations and physical condition. The meters normally provided are only necessary for relative indications of voltage and current levels, and do not require calibration unless they are grossly out of adjustment. Typically, the range of the ammeter is too great if it reads less than half scale under peak demand. The taps and/or faceplate should be changed to a more appropriate value if possible.

7. The current elements of relays, meters and other control devices are usually connected to the secondary circuit of current transformers (CT's). OPENING THE SECONDARY CIRCUIT OF AN ENERGIZED CURRENT TRANSFORMER WILL PRODUCE AN EXTREMELY HIGH VOLTAGE WHICH CAN BE FATAL. THE SECONDARY TERMINALS OF AN ENERGIZED CURRENT TRANSFORMER MUST BE SHORT-CIRCUITED BEFORE OPENING THE SECONDARY.
8. The relays typically associated with switchgear are overcurrent, over/underfrequency, over/undervoltage, reverse power, arc fault/flash, etc., and are designed for instantaneous or time-delay operation. These relays are used to sense abnormal conditions and are vital to the proper operation of the system. It follows that the relays shall be tested and should receive a thorough inspection, calibration and test on a five year basis. The manufacturer's instructions should be consulted for the proper procedures, test equipment, "pick-up" values and time curves.
9. Ideally, all bolted joints on busbars, cable terminal lugs and circuit breaker lugs will be torqued to manufacturer's specifications during installation. BY DEFINITION, A CONNECTION CANNOT BE TORQUED WITHOUT A TORQUE WRENCH. This operation will be observed through an on-site inspection by the Owner's engineer/consultant.
10. Maintenance of busbars and other conductors consists of keeping them clean, dry and tight. **As part of equipment testing, arrange with Owner via MOP to control building loads and/or load bank to load the equipment as much as possible. During peak load conditions, use an infrared camera to scan all bus, connections, and terminals for indications of "hot spots". Be aware that this test could be very marginal if the switchgear is lightly loaded. Provide documented test results.**
11. After de-energizing the switchgear, Contractor to clean the interior with a soft brush and vacuum (no metal nozzles, please). Do not use compressed air as this only blows the dust around the interior, except where there is no other option. Inspect the interior thoroughly for signs of moisture, oil or over-heating. Ensure that all connections are tight.
12. Carefully clean and carefully re-torque to manufacturer's specifications any connection which was found loose, indicated overheating (such as discolored insulation) or appeared as a "hot-spot" under the infrared scan. While cleaning, use extreme care on plated surfaces. Replace, rather than re-use conical washers. Some brands of non-oxidation compound are very flammable, so use as little as necessary when applying to aluminum surfaces.

### 3.04 ELECTRICAL TEST:

- A. Perform tests required by Consultant and Owner for all busses and equipment to indicate compliance with specifications, drawings, standards and applicable codes. Provide sufficient instruments, labor, technical support and materials for performing these tests. Tests shall be performed to the satisfaction of the Consultant and the Owner. Four weeks prior notice of testing is required.
  1. Insulation – use 1000 VDC insulation tester (0-2000 megohm full-scale, equivalent to "Megger" as manufactured by Biddle Company. Test conductors and busses of all systems, including switchboards, switchgear, panelboards, disconnects, molded case switches, ATS, starters, branches, motors, devices, equipment, etc. Test branches for one (1) minute. Test feeders, bus ducts, busses, etc., for 15 minutes with readings at one minute intervals.
  2. Receptacles: Use Woodhead Ground Loop Impedance Tester. Test each receptacle. Record readings.

- B. Record all test results on Test Form in loose-leaf three ring notebooks and electronic for Owner close-out documents. Test information required: Date of test; name of circuit or equipment; ambient temperature; weather conditions; final instrument readings; graph of continuous recorded tests, test equipment manufacturer, model, etc., and calibration date/certificate. Provide three copies and electronic of log. At completion of all tests, original test data shall be given to Owner at the conclusion of each test.
- C. Provide electronic copy of test reports to Engineer prior to energizing respective equipment and/or conductors.
  - 1. Test Values:
    - a. Bolt torque levels shall be in accordance with manufacturer specifications.
    - b. Insulation resistance test to be performed per NETA and in accordance with manufacturer's specifications.
    - c. Perform special tests and adjustments as listed in Scope of Work and/or Technical Sections listed in related work above.
    - d. In absence of manufacturer data use NETA Standards.
    - e. Immediately advise Contractor and Engineer of abnormal readings.

### **3.05 CIRCUIT BREAKERS - LOW VOLTAGE POWER (AIR)**

- A. Visual and Mechanical Inspection:
  - 1. Inspect for physical damage and nameplate compliance with single line diagram.
  - 2. Mechanical operational tests shall be made in accordance with manufacturer's instruction manual. Check adjustments on springs, gears, liners, etc.
  - 3. Cell fit and element alignment shall be checked.
  - 4. Check tightness of connections.
  - 5. Inspect arc chutes.
- B. Electrical Tests:
  - 1. A contact resistance test shall be performed.
  - 2. An insulation resistance test shall be performed at 1000 volts D.C. for one (1) minute from pole to pole and from each pole to ground and across open contacts of each phase.
  - 3. Minimum pickup current shall be determined by primary current injection.
  - 4. Long time delay shall be determined by primary injection at three hundred percent (300% pick up current).
  - 5. Short time pickup and time delay shall be determined by primary injection of current compared with time current coordination curve.

6. Instantaneous pickup current shall be determined by primary injection based on time current coordination curve.
7. Trip unit reset characteristics shall be verified.
8. Adjustments shall be made for final settings in accordance with engineer's prescribed settings.
9. Auxiliary protective devices, such as ground fault or under voltage relays, shall be tested in accordance with other portions of this specification and activated to insure operation of shunt trip devices. Ground fault devices shall be activated based on time current coordination curve for the ground fault relay.
10. Reduced Energy Let Through – Test the Reduced Energy function with breaker installed in switchgear and with primary current injection testing to confirm manufacturer's published data for tripping values and timing.

C. Test Values:

1. Contact resistance shall be determined in micro-ohms. Any values exceeding two hundred (200) micro-ohms or any values which deviate from adjacent poles or similar breakers by more than fifty percent (50%).
2. Insulation resistance shall not be less than fifty (50) megohms.
3. Pickup current, trip time and instantaneous pickup values shall be adjusted to engineer settings. Test values should fall within manufacturer's published time current characteristics tolerance band.

### **3.06 CIRCUIT BREAKERS - LOW VOLTAGE INSULATED AND MOLDED CASE**

A. Visual and Mechanical Inspection:

1. Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.
2. Operate circuit breaker 4-6 times without load to insure smooth operation.
3. Inspect case and arc chutes for cracks or defects.
4. Check tightness of connection with torque wrench in accordance with manufacturer's recommendations.

B. Electrical Tests:

1. Contact resistance shall be measured.
2. Minimum pickup current shall be determined by primary current injection.
3. Long time delay shall be determined by primary injection at three hundred percent (300% pick up current).
4. Short time pickup and time delay shall be determined by primary injection of current compared with time current coordination curve.
5. Instantaneous pickup current shall be determined by run-up or pulse method. Clearing times should be within four (4) cycles or less. Pick up current shall be based on time current coordination curve.

6. Trip unit reset characteristics shall be verified.
7. Adjustments shall be made for final settings in accordance with engineer's prescribed settings.
8. Auxiliary protective devices, such as ground fault or under voltage relays, shall be tested in accordance with other portions of this specification and activated to insure operation of shunt trip devices. Ground fault devices shall be activated based on time current coordination curve for the ground fault relay.
9. Insulation resistance shall be determined pole to pole, across pole and pole to ground. Test voltage shall be 1000 volts D.C.

C. Test Values:

1. Contact resistance shall be compared to adjacent poles and similar breaker. Deviations of more than fifty percent (50%) shall be investigated.
2. Insulation resistance shall not be less than fifty (50) megohms.
3. All tripping times shall fall within manufacturer's time current coordination tolerance band. Circuit breakers with trip times varying from published tolerance band more than  $\pm$  10% at three hundred percent (300%) current shall be replaced.
4. Instantaneous pickup current levels should be within twenty percent (20%) of manufacturer's published values.

### 3.07 INSTRUMENT TRANSFORMERS

A. Visual and Mechanical Inspection:

1. Inspect for physical damage and compliance with design drawings.
2. Check mechanical clearances and proper operations of all disconnecting and grounding devices associated with potential transformers.
3. Verify proper operation of grounding or shorting devices.

B. Electrical Tests:

1. Current transformers shall have secondary saturation tests done at a minimum of three (3) points below and one (1) point above knee of saturation curve.
2. Confirm transformer polarity electrically.
3. Burden tests to be made at the secondary leads of the CT to assure accurate translation of primary current.
4. Verify connection at secondary CT leads by driving a low current through the leads and checking for this current at applicable devices.
5. Confirm transformer ratio.
6. Measure insulation resistance of transformer secondary winding and leads with volt megohm meter.

7. Measure transformer primary insulation with applicable over potential tests.
8. Verify connection of secondary PT leads by applying a low voltage to the leads and checking for this voltage at applicable devices.
9. Check for PT secondary load with secondary voltage and current measurements. Make sure load is less than VA of PT.

### **3.08 METERING AND INSTRUMENTATION**

#### A. Visual and Mechanical Inspection:

1. Examine all devices for broken parts, indication of shipping damage and wire connection tightness.
2. Verify meter connections in accordance with single line meter and relay diagram.

#### B. Electrical Tests:

1. Calibrate all meters at midscale. Calibration instruments shall have precision no more than fifty percent (50%) of the instrument being tested.
2. Calibrate watt-hour meters to one half percent (1/2%).

### **3.09 GROUND FAULT SYSTEMS**

#### A. Visual and Mechanical Inspection:

#### B. Inspect for physical damage and compliance with plans and specifications.

#### C. Inspect neutral main bonding connection to assure:

1. Zero sequence system is grounded upstream of sensor.
2. Ground strap systems are grounded through sensing device.
3. Ground connection is made on supply side of neutral disconnect link.

#### D. Inspect control power transformer to insure adequate capacity for system.

#### E. Monitor panels (if present) shall be manually operated for:

1. Trip
2. No trip test
3. Non-automatic reset
4. Proper operation and test sequence shall be recorded.
5. Zero sequence systems shall be inspected for symmetrical alignment of core balance transformers about all current carrying conductors.
6. Ground fault device circuit nameplate identification shall be verified by device operation.

7. Pick up and time delay settings shall be set in accordance with engineer's prescribed settings.
  8. Electrical Test:
  9. System neutral insulation resistance shall be measured to ensure no shunt ground paths exist, neutral ground disconnect line shall be removed, neutral insulation resistance measured, and link replaced.
  10. The relay pickup current shall be determined by primary injection at the sensor and the circuit interrupting device operated.
  11. The relay timing shall be tested by injecting one hundred fifty percent (150%) and three hundred percent (300%) of pick up current into sensor. Total trip time shall be electrically monitored.
  12. System operation shall be tested at fifty-seven percent (57%) of rated voltage.
  13. Zone interlock systems shall be tested by simultaneous sensor current injection and monitoring zone blocking function.
- F. Test Parameters:
1. System neutral insulation shall be a minimum of two (2) megohms or greater.
  2. Relay pickup current shall be within ten percent (10%) of device dial or fixed setting, and in no case greater than twelve hundred (1200) amperes.
  3. Relay timing shall be in accordance with manufacturer's published time current characteristics curves but in no case longer than one (1) second.
  4. Provide Electrical (Primary Injection) test equipment capable of producing test current at full range scale of settings and rated system current to demonstrate actual field testing when system is installed.

### **3.10 TESTING OF GROUND SYSTEM**

- A. Testing of grounding system and made ground electrodes will be performed by the Contractor.
- B. A measuring device which generates appropriate A.C. voltage and frequency to measure earth resistance and resistance of electrode systems using "fall of potential" method of measurement performed in accordance with IEEE Standard 81-1991. Instrument similar to Biddle Megger (null balance) Earth Tester will be used.
- C. Contractor shall drive test electrodes in accordance with instructions of Standard Ground Testing and practices.
- D. Ground systems and electrodes will be tested only when earth is dry. Measurements will include the earth resistivity and resistance of electrodes and grounding systems.
- E. Where resistance of grounding systems is greater than 5 ohms, Contractor shall perform an investigation of installed system to determine the cause of undesired results and correct any installation of deficiencies which would cause the measurements to be poor. The Contractor shall retest the system found deficient in installation at no additional cost.

- F. Record ambient temperature, date, time, approximate water table level (as obtained from local geologists); type of earth materials; earth resistivity.
- G. Recorded resistance readings shall be included on "Record Drawings".

**3.11 AUTOMATIC TRANSFER SWITCHES:**

- A. Before ATS is placed into service, notify and coordinate with Engineer and Owner (4 weeks minimum written notice required) for Witness Testing of all ATS functions, features, alarms, safeties, etc. to the satisfaction of Engineer.
- B. ATS shall have permanent normal and emergency sources connected and, if possible (where specified), Load Bank connected to load bus for Witness Testing. The intent is to combine the efforts of generator system Load Bank testing with ATS testing. ATS to follow generator testing.
- C. ATS manufacturer's Certified Factory Trained Technician shall conduct all tests and demonstrate all functions and features of the ATS, including extended overlap (for CTT) safety and main commercial trip to the satisfaction of Engineer/Owner. All systems associated (generator, main commercial breaker, etc.) shall be interconnected and functioning during test. Provide waveform metering capture equipment to capture closed transition overlap waveform and time.

**3.12 LOW-VOLTAGE SURGE PROTECTION DEVICES**

- A. Perform Visual and Mechanical Inspection
  - 1. Compare equipment nameplate data with drawings and specifications.
  - 2. Inspect physical and mechanical condition.
  - 3. Inspect for correct mounting and adequate clearances.
  - 4. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Appendix A Tables.
  - 5. Perform thermographic survey as specified below.
  - 6. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
  - 7. Electrical Tests:
    - a. Perform insulation-resistance tests. Use manufacturer's recommended values or same values listed below.

<u>Maximum Rated Voltage</u>	<u>Minimum D.C. Test Voltage</u>	<u>Minimum Insulation Resistance</u>
250	500	25 Meg ohm
600	1,000	100 Meg ohm
5,000	2,500	1,000 Meg ohm
8,000	2,500	2,000 Meg ohm
15,000	2,500	5,000 Meg ohm
25,000	5,000	20,000 Meg ohm



**3.13 THERMOGRAPHIC SURVEY:**

- A. During MOPs and when Load is at peak conditions (tie or bypass conditions) via Load Bank perform Thermographic Survey per Engineer/Owner to include:
  - 1. All plug-in busway
  - 2. All terminations
  - 3. Complete UPS system
  - 4. All new and existing incoming Utility service Switchgear
  - 5. All new Generator related equipment/switchboards
  - 6. All conductors
  - 7. Switchboards
  - 8. Panelboards
- B. Perform Visual and Mechanical Inspection
- C. Inspect physical, electrical, and mechanical condition.
- D. Remove all necessary covers prior to thermographic inspection.
- E. Equipment to be inspected shall include all current-carrying devices.
- F. Provide report including the following:
  - 1. Discrepancies.
  - 2. Temperature difference between the area of concern and the reference area.
  - 3. Cause of temperature difference.
  - 4. Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.
  - 5. Identify load conditions at time of inspection.
  - 6. Provide photographs and/or thermograms of the deficient area.
- G. Test Parameters
  - 1. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1°C at 30°C.
  - 2. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
  - 3. Thermographic surveys should be performed during periods of maximum possible loading typically during load testing or after placed into service and testing with building load, but not less than 40 percent of rated load of the electrical equipment being inspected. Refer to NFPA 70B, Testing (Infrared Inspection).

#### H. Test Results

1. Temperature differences of 1°C to 3°C indicate possible deficiency and warrant investigation.
2. Temperature differences of 4°C to 15°C indicate deficiency; repair as time permits.
3. Temperature differences of 16°C and above indicate major deficiency; repair immediately.

#### 3.14 OTHER TESTS:

- A. Where specified in Technical Sections, (See Related Work Sections listed above) Test Engineer shall test equipment and devices in accordance with tests specified therein.
- B. Arc Flash Relay System – Bench test Relay and all components per NETA. With all equipment installed in switchgear, test each sensor and zone function, to include breaker tripping and timing, to confirm all manufacturer's published data for sensing, tripping, timing, protection, etc.
- C. Reverse Power Relay System – Bench test Relay and all components such as CTs, etc. per NETA. Utilize primary current injection testing with all equipment in switchgear to confirm actual trip settings.
- D. Modified Differential Ground Fault System – After all breakers have been tested, Bench test Relays (if used) and then test complete system as a whole, once complete switchgear system is installed via primary current injection testing, to confirm complete MDGF system test procedures. This will require an MOP after Sequence of Work Phase 3 is complete to place total facility load on Generator support and de-energizing all utility services in transformer vault by Utility. Include all related costs in bid for this testing MOP.

#### 3.15 SYSTEM FUNCTION TESTS:

- A. All Electrical Equipment and Systems shall be function tested individually and all together as a system to ensure total system operation prior to placing into service and after placing into service.
- B. Upon completion of equipment component tests as defined herein, the system functional tests shall be performed. It is the intent of system functional tests to demonstrate the proper interaction of all sensing, processing, control, alarms, and action devices to affect the desired end product or result as designed and specified. Engineer and Owner to witness functional testing and 30 day advance notice required for all testing.

#### 3.16 RECOMMENDATIONS:

- A. All discrepancies should be brought to the immediate attention of the Consultant/Owner.
- B. "As found" and "as left" conditions including trip currents and times should be recorded.

#### 3.17 TESTING COMPLETION:

- A. Remove temporary feeders installed during testing.
- B. Clean up working areas.
- C. Provide in writing a list of equipment that failed or needs to be repaired. Review this list with the Consultant/Owner. Discuss replacement and repair and determine need for retesting of repaired units or new replacement devices.

**3.18 TEST REPORT:**

- A. Test form Equipment ID shall reference name used on one-line diagram.
- B. The test report shall include the following:
  - 1. Summary of project
  - 2. Description of equipment tested
  - 3. Description of test
  - 4. Temperature and relative humidity
  - 5. Test results
  - 6. Conclusions and recommendations
  - 7. Appendix, including appropriate test forms
- C. All test data shall be recorded on the appropriate test forms.
- D. Furnish electronic and four bound copies of the complete report to the engineer no later than thirty (30) days after completion of testing unless directed otherwise. Provide an electronic copy of the original test data to Engineer/Owner at the conclusion of each test.
- E. Furnish electronic and four copies of summary of all major items requiring repair or replacement within 24 hours of test. If test duration is extended furnish daily summary of items found the day before.

**3.19 OBSERVATION:**

- A. Consultant/Owner may witness all specified testing. Four week notice is required.

**3.20 CALIBRATION:**

- A. All test equipment shall be calibrated within 1 year prior to testing. Calibration shall be documented and provided to consultant prior to test.

**3.21 SAFETY:**

- A. Personnel involved in testing shall perform tests in a safe and workmanlike manner per all governing requirements. All existing safety practices pertaining to working in and around electrical equipment should be reviewed and carefully followed by all personnel. All areas and equipment shall be closed and safeguarded to prevent accidental damage, injury and power interruption.
- B. Back out and emergency procedures must be developed in the event a problem occurs during testing. Telephone numbers of the local power company and a knowledgeable electrical maintenance contractor shall be on site.

**END OF SECTION**

**SECTION 26 2100  
ELECTRICAL SERVICE ENTRANCE**

**PART 1 - GENERAL****1.01 RATING**

- A. Primary Service: 15,000 volts, 3 phase, 4 wire, grounded neutral
- B. Secondary Service: 277/480 volts, 3 phase, 4 wire, grounded neutral, wye connected

**1.02 SERVICE AND UTILITIES**

- A. Contractor shall arrange and coordinate with the local electric service company for service to be brought to building, and for the installation of the meter(s). Pay all charges (if any) in connection therewith, including permanent meter deposit, which deposit will be refunded to the Contractor at the time of the Owner's occupancy of the building. Location of Utility service shall be coordinated with all trades and other Utilities.
- B. It is the responsibility of this Section, prior to bid, to re-affirm with the Utility Companies involved, that locations, arrangement, Power Company voltage, phase, metering required, and connections to Utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the contract price shall include an additional cost necessary to meet those regulations without extra cost to the Owner after bids are accepted.
- C. Obtain from the Utility Company any additional charges for service of type, size and location called for. Include charges in the bid to be paid by the Contractor to the appropriate party. Provide payment of these charges so as to allow a logical progression of construction and avoid delay of completion.
- D. Furnish with shop drawings a signed document from each Utility company describing the location and type of service to be supplied and requirements for service. The document shall be signed by the appropriate responsible representative of the respective Utility Company.

**PART 2 - PRODUCTS (Not Applicable)****PART 3 - EXECUTION****3.01 PAD MOUNTED TRANSFORMER SERVICE**

- A. Service to the facility consists of an underground primary service from riser pole, pad mounted equipment or underground vault to the new pad mounted transformer, with underground secondary service from transformer(s) to main distribution equipment.
- B. Power Company furnishes and installs following:
  - 1. All facilities on primary service side.
  - 2. Primary cable from the primary service to the pad mounted transformer complete with connections at each end.
  - 3. Pad mounted transformer complete.

C. Contractor to furnish and install the following:

1. Primary duct bank from primary service (equipment, pole, or vault) to transformer. Duct bank consists of PVC duct encased in concrete as shown. See Section covering "Raceways". Use long radius, 36" minimum, PVC elbows, same as duct. Terminate ducts at pole/equipment with cast iron double hubs as directed by Utility. Terminate ducts in transformer pad with approved bushings.
2. Transformer pad: Build the transformer pad to the Utility's specifications. The pad consists of 3000# concrete reinforced with #4 steel bars 12" oc. in both horizontal directions. Provide 1" x 45 degree chamfer on all top edges. Obtain detail drawings from the Utility for location of anchor bolts, and complete pad details. Pad construction to conform to the Utility details. Provide two 3/4" x 10" copper clad steel ground rods in pad as shown or as required by Utility.
3. Underground secondary service from the transformer consists of conductors in conduit. Terminate the conduits inside transformer. Make secondary connections to the transformer and leave necessary slack conductors for secondary connections.
4. Coordinate all service work with the Utility and install the work in accordance with their requirements and recommendations.

**3.02 METERING**

- A. Install devices and conduit for Utility metering of secondary service as shown. The utility will furnish the meter, meter socket, CT Cabinet, donut CT's and meter conductors to Contractor for installation. Install any additional conduit, junction boxes, etc., as required by the Utility.
- B. Install the meter equipment in accordance with utility requirements.

**END OF SECTION**

**SECTION 26 2416  
PANELBOARDS****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK:**

- A. Furnish and install lighting and power panelboards, rated 600 volts or less, as specified herein and as shown or indicated on the drawings and schedules.

**1.02 SUBMITTALS:**

- A. Provide shop drawings for each panelboard. Refer to Section 26 0121. Include individual diagram of each panelboard showing all specified requirements. In addition, submittals shall indicate overall panelboard dimensions, interior dimensions, bus configuration, wire gutter dimensions, short-circuit current rating of panelboard and overcurrent protective devices.

**1.03 STANDARDS:**

- A. Construct panelboards in accordance with latest edition of the following standards:
  - 1. UL standards No. 50, 67, 98, 489, and 493
  - 2. NEMA publication PB-1.
  - 3. NEC (NFPA-70) Article 384.
- B. Panelboard assembly shall be UL labeled, and UL labeled as Service Entrance Equipment where used for that purpose.
- C. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.

**PART 2 - PRODUCTS****2.01 PANELBOARD CONSTRUCTION**

- A. Panelboards to be same manufacturer as other distribution equipment.
- B. Panelboards and over current device shall have integrated equipment fault rating equal to or greater than the available fault current.
- C. Bussing:
  - 1. All bussing shall run the full length of the panelboard for maximum possible future installation.
  - 2. Bussing shall be 98% conductivity copper, silverplated at joints. Minimum panelboard bus current rating shall be equal to or greater than the current rating of the overcurrent protective device feeding the panelboard.
  - 3. Bus assembly shall be designed for a maximum temperature rise of 55 degrees C above 40 degrees C ambient temperature when carrying rated current.
  - 4. Minimum thickness of bus bars shall be 3/32".
  - 5. Bussing shall be braced to withstand a fault current equivalent to the highest device interrupting capacity in the panel.

6. Neutral bus copper shall be sized for 100% on same basis as phase bussing as described above and insulated from the cabinet. Provide removable NEC approved grounding means in panelboards to be used for service entrance. Make provisions for ground fault CT's where required for breakers specified with ground fault trips.
7. Arrange bus bar connections so that adjacent vertical circuit protective devices are consecutively connected to phases A, B, and C throughout panel.
8. Provide 25% capacity continuous copper ground bus in each panel cabinet, bolted to cabinet. The ground bus shall be capable of carrying the required short circuit current.

## **2.02 CABLE TERMINATIONS:**

- A. Provide separate phase, neutral and ground wire connections for each conductor.
- B. Make all terminations with separate, individual, heavy duty, solid copper barrel compression type lugs. Use lugs similar to those specified for conductors.
- C. Use 2 bolt tongue or equivalent anti-turn connection to bus for #1/0 or larger cables.
- D. Securely bolt lugs to bus with properly sized bolts, nuts and lock washers. Tighten with torque wrench to proper tightness as recommended by Manufacturer.
- E. Provide double lugs on main bus where shown. Use offset compression lugs as required.
- F. Use of feed-through lugs (one set of lugs on each end of main vertical bus) is not acceptable unless specifically noted.

## **2.03 CIRCUIT BREAKERS (SHALL BE EQUIPPED AS FOLLOWS):**

- A. Provide molded case circuit breakers equipped with (e/w), thermal-magnetic, quick-make, quick-break, trip free on faults, thermal-inverse time delay element and magnetic instantaneous trip coil in each ungrounded phase conductor or approved equivalent 4 function solid state trip unit.
- B. Engrave breaker ampere rating on handle or trip unit.
- C. Furnish multi-pole breakers with internal common trip.
- D. Ground fault breakers class "A" type to trip on fault currents of 4-6 ma. GFCI circuit breakers shall have frequency suppression circuitry to prevent false tripping and a separate neutral-to-load neutral conductor.
- E. Main circuit breakers UL rated for service entrance use.
- F. All breakers serving motor loads shall have adjustable instantaneous function.
- G. All breakers 300 amperes and larger shall have interchangeable trip units.
- H. Breakers shall be switch "SWD" rated where required by NEC, and Type HACR rated for heating, air-conditioning and refrigerating equipment.
- I. Furnish locking devices for branch circuit (0-70 ampere) breakers as noted on drawing. All breakers in feeder panels (CCB) shall be provided with built in lock hasp for locking breaker in "off" position.
- J. All tie breakers in panelboards shall be suitable for reverse feed.

**2.04 PANELBOARDS SHALL BE CLASSIFIED BY TYPE OVER-CURRENT PROTECTION AS FOLLOWS:**

- A. BQL Bolted quick-lag circuit breaker distribution, 0-100 ampere branches, with minimum interrupting rating of 22,000 symmetrical amperes at 208 volts. Equivalent to Square "D", NQOD, Siemens S1, Cutler-Hammer, Pow-R-Line 1A, G.E. AQ.
- B. CCB Heavy duty convertible plug-in 100% continuous rated circuit breaker distribution, 0-800 ampere branches with minimum interrupting rating of 65,000 symmetrical amperes at rated voltage. Equivalent to Square "D", I-Line, Siemens SS, Cutler-Hammer, Pow-R-Line 4B, G.E. Spectra.
- C. All space in panelboards shall be usable provisions. All panelboard provisions shall be fully provided with bussing and necessary connections for installation of future overcurrent devices. All panelboards shall have minimum 25% spare space.

**2.05 IDENTIFICATION:**

- A. Permanently attach nameplates and circuit numbers to panel with 2 screws.
- B. Use vertical consecutive permanent circuit numbers for lighting and appliance panels.
- C. Provide typewritten circuit directories describing service of each circuit after loads have been balanced.
- D. Provide laminated plastic nameplate circuit identification for each circuit in Type CCB panels.
- E. Provide each panelboard with nameplate showing panel designation, voltage rating and phase. Indicate source of power (feeder origin). Feeder origin shall include switchgear/switchboard designation, floor number, and floor location ID or nearest column number.
- F. Label shall be engraved laminated-plastic nameplate mounted with two (2) cadmium plated screws. Nameplates shall be per Section 26 0553.
- G. Acceptable Panelboard Manufacturers:

General Electric/ABB  
Siemens  
Square D  
Cutler-Hammer

**2.06 CABINETS: (SAME MANUFACTURE AS PANELBOARD INTERIORS)**

- A. Cabinet shall be code gage thickness, hot dip galvanized steel or painted with trim and door. Hardware shall be combination latch and cylinder lock; all keyed the same. Provide celluloid or plastic covered directory card and holder on the inside of door. Trim, door and exposed interior shall be finished with factory prime and smooth finish with smooth standard gray powder coat paint. Reinforce cabinets as necessary for service and short circuit rating intended and seismic conditions specified.
- B. Cabinets shall be flush or surface mounted as indicated on drawings and shall be of sufficient size to allow NEC required 3" gutter space each side of panel and at top and bottom of panel: minimum 20" wide. Provide adjustable trim clamp, semi-flush hinges and inside rabbet.



- C. Enclosures shall be NEMA 1 for indoor installations except where the NEC requires other type of enclosure.
- D. Provide panels with door-in-door construction.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION:**

- A. Mount panelboards securely to building structure with 3/8" minimum diameter galvanized bolts and inserts number as required for size of panel, but not less than 4. Mount panelboards with centerline 4'-6" approximately above finished floor with the top a maximum of 74" AFF. Where panels of different heights are mounted adjacent, install top of panel trim at same height above floor. Close all unused openings.
- B. Mount feeder panelboards taller than 66" on 4" high 2500 # concrete pad and bolt to wall and pad with 1/2" diameter bolts and inserts.
- C. Where two sets of feeder cables are required in panel gutter space, run one set in each side of panel.
- D. Install filler plates in unused spaces.
- E. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits below slab not on grade.
- F. Arrange conductors into groups, and bundle and wrap with plastic wire ties after completing load balancing.
- G. Set field adjustable switches and circuit breaker trip ranges as indicated.
- H. Connect only one wire/cable to each breaker terminal.
- I. Balance loads for each panelboard as much as possible in accordance with NEC Article 220.
- J. At final completion of project, install as-built, plastic encapsulated panel schedules on inside surface of panelboard door. Use epoxy glue.
- K. Floor and wall space allocation should consider the addition of future panels and comply with NEC space requirements.

**END OF SECTION**

**SECTION 26 2800  
ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Furnish and install safety switches, disconnects and separately mounted enclosed circuit breakers rated to 1200 amperes, 600 volts as shown on the drawings and specified herein.

**1.02 SUBMITTALS**

- A. Provide shop drawing for all equipment including fuses and circuit breakers. See Section 26 0121 – Electrical Submittals.

**1.03 STANDARDS**

- A. UL Standard No. 98
- B. NEMA Standard KS1-1983 for Enclosed Switches
- C. NEMA AB1-1996 for Mold Case Circuit Breakers & Switches

**PART 2 - PRODUCTS****2.01 SEPARATELY MOUNTED CIRCUIT BREAKERS**

- A. Furnish and install separately mounted circuit breakers for overcurrent protection of feeders and branch circuits where shown on drawings.
- B. Circuit breakers shall be: 100% continuous rated thermal-magnetic, molded case type, rated 600 volts, with interrupting rating of 22,000 rms amperes symmetrical minimum at 240 volts and 65,000 rms amperes symmetrical minimum at 480 volts. Four (4) function solid state trip units may be used if accepted by the Consultant.
- C. The individual circuit breakers shall be furnished with provisions for locking with a padlock. Enclosures for switches shall be NEMA 1 general purpose, NEMA 3R waterproof, NEMA 4 watertight, NEMA 4X Watertight (stainless steel), or special enclosure, as shown.
- D. Provide mechanical lugs and power-distribution connectors for number, size and material of conductors as indicated on drawings.
- E. Acceptable Circuit breaker manufacturers:

General Electric  
Square D  
Siemens  
Cutler Hammer/Westinghouse

**2.02 MOLDED CASE SWITCHES (Non-Automatic Circuit Breakers)**

- A. Use 600 volt rated molded case switches to perform motor and all other disconnect functions. Molded case switches may utilize fixed, high-set instantaneous trips. Minimum short circuit withstand rating of molded case switches shall be 65,000 symmetrical amperes at 480 volts as determined by overcurrent devices protecting the circuit, and available fault current at the switch. Switches shall be suitable for reverse feed.

- B. Furnish switches with provisions for locking the switch open with a padlock.
- C. The molded case switches shall be furnished with provisions for locking with a padlock. Enclosures for switches shall be NEMA 1 general purpose, NEMA 3R waterproof, NEMA 4 watertight, NEMA 4X Watertight (stainless steel), or special enclosure, as shown.
- D. Acceptable Molded Case Switch Manufacturers:
  - General Electric
  - Square D
  - Siemens
  - Cutler Hammer/Westinghouse

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Refer to specification Section 26 05 53 – Identification for Electrical Systems for nameplates.
- B. Secure disconnect switches to building or equipment surface as shown. Where the surface is not adaptable for mounting, provide Unistrut P-1000 rack mounted as directed to secure switch. Provide galvanized stainless steel hardware outside or where exposed to moisture.
- C. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.
- D. If mounting more than one device in a single location, group mount on a 3/4" plywood backboard painted with fire retardant paint.
- E. All exterior mounted switches shall comply with NEC 372.2.
- F. All switches shall be mounted to comply with NEC 380.8.

**END OF SECTION**

**SECTION 26 3213.19**  
**NATURAL GAS ENGINE DRIVEN GENERATOR SETS**

**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK:**

- A. This section of the specifications includes coordination items and responsibilities of the contractor for Generator and related equipment to include the furnishing, installation, connection and testing of the engine generator and related systems.
- B. The engine generator system shall be fully automatic and shall be complete and coordinated system ready for operation.
- C. The engine generator system specified herein shall be complete, including, but not limited to engine, lube-oil system, fuel system, cooling system, intake and exhaust system, starting system, alternator, control devices, wiring to interface with generator controls and supervisory systems as specified under other sections.
- D. All equipment shall be new and of current production of the manufacturer of the engine generator as an integral standby electric plant.
- E. The manufacturer/packager together with its authorized representative, shall have full responsibility for the performance of the engine generator set, control equipment, and its accessories.
- F. Generator, enclosure, etc to meet all emergency/life safety requirements and codes.

**1.02 SUBMITTALS:**

- A. Shop Drawings and Product Data:
  - 1. Submit shop drawings for the engine-generator to indicate all requirements of this Section. Submit shop drawings in accordance with Section 26 0121 Electrical Submittals.
  - 2. Data shall be submitted in the following form:
    - a. Technical Data Sheets (TDS): These include published performance, rating and de-rating curves, published ratings, catalog cuts, pictures, manufacturer's specifications, material composition and gauge thickness, etc.
    - b. Description of operation (DO): Manufacturer's literature and, if suitable, diagrams.
    - c. Calculations (CALC): Detailed engineering calculations with all equations, graphs, assumptions, and approximations shown, and data sources referenced. Load study, Fault current study, coordination study, etc.
    - d. Certification (CERT): Written confirmation as to a document's accuracy, and genuineness.
    - e. Shop Drawings (SD): Scaled drawings showing dimensions, plan views, side views, elevations, and cross sections.
    - f. Diagrams (DGM): These include Control System diagrams, elementary diagrams, control sequence diagram or table, wiring diagrams, interconnection diagrams, wireless connection diagrams, illustrative diagrams, and flow diagrams, etc.
- B. The following data shall be submitted to the Consultant for review prior to fabrication. For each engine-generator set, and control and supervisory equipment:

1. Engine generator set: TDS, SD, CALC
2. Engine jacket water heaters: TDS, SD.
3. Silencer assembly: TDS, SD
4. Torsional Vibration: CERT
5. Control and Supervisory Equipment: TDS, DGM, DO, SD. Submit a composite terminal to terminal diagram showing all controls, alarms, metering, etc.
6. Voltage regulating equipment, TDS, DGM
7. Frequency regulating equipment: TDS, DGM
8. Voltage and frequency dips and recovery times due to specified motor loading block loading: CACL, TDS, CERT
9. Attitude and Ambient de-rating: TDS
10. Fuel de-rating (i.e., Natural Gas vs. Diesel Fuel): TDS
11. Radiator: TDS, SD
12. All Flexible Hoses: TDS, SD
13. Engine mounted control cabinet: TDS, DO, SD, DGM.
14. Erection drawing of engine-generator set showing physical arrangement, enclosure, mounting arrangement, location of vibration isolators, piping, fuel location inlets and outlets, valves, temperature and speed sensors, batteries, lube oil system, panel, electrical work, etc. Minimum scale  $1/2" = 1'-0"$ .
15. Engine horsepower curves of the engine rating for standby power application based on actual testing of a similar package. Special ratings or "maximum" ratings will not be acceptable.

C. Certifications:

1. Certify in writing that a engine of the same model with the same bore, stroke, number of cylinders, same turbocharger arrangement, configuration and equal or higher BMEP and RPM ratings as the proposed engine has been operated satisfactorily, with connected loads of not less than 75% of the specified KW/KVA rating, for not less than 2,000 hours without any failure of a crankshaft, camshaft, piston, valve, injector or governor system.
2. Certify in writing that devices and circuits will be incorporated to protect the voltage regulator and other components of the auxiliary electrical power system during operation of the engine-generator set at speeds other than the rated RPM while performing maintenance. Include thorough descriptions with submittals of any precautions which will be necessary to protect the voltage regulator and all other components of the system during operation of the engine-generator set at speeds other than the rated RPM.
3. Furnish system free of injurious torsional and bending vibrations within entire speed range from 0 to 125% of synchronous speed. Submit prototype certification of vibration analysis.
4. Factory Test Report: Submit certified test reports, strip chart recordings of load, ambient temperature, water temperature (inlet and outlet) and photographs showing test set-up and equipment.
5. Certify that the Generator, enclosure, etc. meets all emergency/life safety requirements and codes.

D. Operation and Maintenance Manuals:

1. Submit three (3) complete legible and one electronic operating and maintenance manuals for the engine-generator set and auxiliaries including wiring diagrams, technical data sheets and information for ordering replaceable parts. See Section 26 0121.
2. Diagrams:
  - a. Include complete interconnection diagrams which indicate all components of the system.
  - b. Include complete diagrams of the internal wiring for each of the items of equipment.
  - c. The diagrams shall have their terminals identified to facilitate installations, operation, and maintenance.
3. Maintenance Data:
  - a. Furnish copies of complete lists of the spare parts and special tools recommended for two years of normal operation of the complete system including the manufacturer's names, addresses, catalog numbers and prices.
4. Operating Instructions Submittal Required:
  - a. Manufacturer's operating instructions for each item of equipment furnished.
  - b. Supplemental with additional specific application instructions where necessary.
  - c. Specific operating instructions for each portion of system which involves multiple items of equipment.
  - d. Instructions for charging, start-up, control or sequencing of operation, phase of seasonal variations, shut-down, safety and similar operations. Typewritten in completely explained and easily understood English language.
5. Maintenance Manual Requirements:
  - a. See Section 26 0121 Electrical Submittals, for complete requirements.
  - b. Emergency instructions including addresses and telephone numbers for service sources.
  - c. Regular system periodic maintenance procedures.
  - d. Proper use of tools and accessories.
  - e. Wiring and control diagram for each system.
  - f. Manufacturer's maintenance data recommendations and procedures including complete parts lists, exploded views, etc. for each operational item in each system.
  - g. Manufacturer's product warranties and guarantee relating to the system and equipment items in the system.
  - h. Shop drawings related to the system.
  - i. Bind each operating and maintenance manual in one or more vinyl-covered, 2", 3-ring binders, plus pocket-folders for folded drawings. Index with them tab for sections.

- j. Mark the back spine and front cover of each binder with system identification and volume number.
6. Spare Parts: Furnish as a minimum, the following spare parts. Where more than one engine is furnished, provide one complete set of spare parts for multiples of two engines.
- a. Provide one complete set each of lubricating oil filters, hoses, fuel filters, air filters, radiator belts, and three (3) each of any relays used.
  - b. Provide one (1) time delay relay of each type, one set of fuses each size, one circuit breaker each size (misc. & not main output) and one set of indicating lamps for battery charger.

### 1.03 JOB CONDITIONS:

- A. Space: Shall conform to the arrangements and details shown on the drawings and to the spaces designated for their installation. The dimensions, enclosures and arrangements shall permit the operating personnel to safely and conveniently operate and maintain the system in the space designated for installation.
- B. Unless specified otherwise, each component of the engine-generator system shall be capable of operating as specified herein at 0-750 feet above sea level in a ventilated room which will have an average ambient air temperature ranging from a minimum of -20°F. in winter to maximum of 120°F., and 90% RH in summer.

### 1.04 STANDARDS:

- A. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference, and form a part of this specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.
  - 1. National Fire Protection Association (NFPA) Publications:
    - a. No. 70 . . . . . National Electrical Code (NEC)
    - b. No. 37 . . . . . Stationary Internal Combustion Engine
    - c. No. 110.....Standard for Emergency and Standby Power Systems
  - 2. Underwriter's Laboratories, Inc. (UL) Publications:
    - a. No. 508. . . . . Electric Industrial Control Equipment
    - b. No. 891. . . . . Dead-Front Electrical Switchboards
    - c. No. 50 . . . . . Cabinets and Boxes
  - 3. National Electrical Manufacturers Association (NEMA) Publications:
    - a. ICS . . . . .Industrial Control and Systems
    - b. IS4 . . . . .Terminal Blocks for Industrial Control Equipment
    - c. I12 . . . . . Electrical Indicating Instrument - Relay
    - d. MG1 . . . . .Motors and Generators

- e. MG2 . . . Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators.
- 4. American National Standards Institute (ANSI) Publications:
  - a. C37.90a . . . IEEE Guide for Surge Withstand Capability (SWC) Test
- 5. Engine Standards
  - a. SAE 1349
  - b. ISO 8528, Part 2
  - c. EGSA 101P
  - d. IEEE 446-1987 (Standby application)

#### **1.05 WARRANTY:**

- A. The Engine-Generator shall be guaranteed by the manufacturer against defects in material and workmanship for a period no less than two (2) years or 1000 running hours from date of acceptance by Owner/Engineer. Warranty shall include all parts, labor, expenses, fees, etc. at the site of the work.

#### **1.06 SEISMIC REQUIREMENTS:**

- B. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL:**

- A. Published Rating:
  - 1. Shall be not less than 130 kW/163 kVA at 120/208 volts 3 phase, 4 wire, 60 Hz, 0.80 power factor.
  - 2. The set shall be rated for standby power as defined by NEMA and EGSA standards, and all shall meet all other requirements specified herein.
- B. Coordinate the components of the system and their arrangements electrically and mechanically.
- C. Connections between components of the system shall conform to the recommendations of the manufacturer of the engine-generator set.
- D. Couplings, shafts, fans, gears, and other moving parts shall be enclosed and guarded. Guards shall be metal, ruggedly constructed, rigidly fastened and readily removable for convenient servicing of the equipment without disassembling any pipes and fittings.
- E. Protect the engine and its water cooling system at all times against freezing weather conditions.
- F. The engine/generator system to be free of injurious torsional and bending vibrations within entire speed range from 0 to 125% of synchronous speed.
- G. The Engine-Generator system shall be capable of operating satisfactorily at rated capacity as specified for not less than 10,000 hours between major overhauls.
- H. Where reasonable uncertainty exists regarding the adequacy of the engine-generator set the contractor shall perform additional tests to verify or modify the submitted data at no additional cost to the Owner.



I. Acceptable Engine/generator manufacturers (provide a cost for each manufacturer):

Kohler  
Caterpillar  
Cummins  
Onan  
Generac

**2.02 ENGINE:**

- A. The engine shall be general purpose, industrial, natural gas, solid injection, water cooled, four cycle, compression ignition type. Engine may be naturally aspirated, scavenged or pressure charged. Scavenger units or pressure chargers shall be quiet under full load operating conditions. Provide rated net horsepower at generator synchronous speed, with all accessories attached required to produce KW specified, taking into account generator efficiency.
- B. Operating speed shall be 1800 RPM.
- C. The engine shall start cold in a 40°F ambient without the use of starting aids such as glow plugs and ether injections. Specified horsepower and KW shall be obtained using natural gas.

**2.03 GOVERNOR:**

- A. The governor control shall be part of the engine manufactures electronic engine electronic controller.
- B. Governor to provide isochronous speed control and proportional load sharing adjustment for use with paralleled engines and interface with Generator Control Panels.
- C. Speed Control: The speed control shall be part of the engine manufactures engine electronic controller.
  - 1. Stability: plus or minus 0.25% maximum frequency variation at any constant load from no load to full load.
  - 2. Regulation: plus or minus 0.25% maximum frequency deviation between no-load steady state, to full load steady state.
  - 3. Transient: 7.0% maximum frequency rise on one-step removal of 0.8 P.F. full load. Maximum recovery time to 1800 RPM - three(3) seconds.
  - 4. Transient: 9.0% maximum frequency dip on step loading in 3 equal steps (approximately 33% of unit rating) maximum recovery time 4 seconds for each step.
  - 5. Transient: 15% maximum frequency dip on block loading of 100% of unit rating with maximum 4.0 second recovery time.
- D. Provide certified prototype response curves for engine with specified generator, governor, etc.
- E. Mount governor controller in associated Engine Control Cubicle.
- F. Provide manual speed adjusting control with local and remote speed control switch mounted on engine control panel in adjacent room.
- G. Do not use governor for overspeed shutdown control and alarm.
- H. Governor shall be modified as necessary by manufacture for proper operation with engine dynamics. Actuator shall have proper torque to provide proper operation over entire dynamic speed range.

- I. Acceptable governor manufacturers shall be:
  1. Engine Manufacture's prior approved standard

#### **2.04 LUBRICATION OIL SYSTEM:**

- A. Provide a pressurized lube oil system with built-in, engine driven, geared, positive-displacement type pump.
- B. Filters shall be duplex spin-on, replaceable type and shall remove particles as small as 12 microns without removing the additives in oil.
- C. Provide an extended lube oil sump drain line passing out through the base. Terminate this line with a drain valve, and end cap fitting (hose connectable).
- D. Provide bayonet level gage. Oil sump shall be quiet (non-pressurized), and oil level monitoring shall be accessible while engine is running without any blow back. Fill engine oil sumps before acceptance testing.

#### **2.05 JACKET WATER COOLING SYSTEM, AND RADIATOR HEAT DISSIPATION:**

- A. Engine Mounted Radiator.
  1. Engine to be liquid cooled with engine mounted, air cooled radiator and engine driven fan.
  2. Cooling liquid to circulate through engine block, inter-cooler, oil cooler, etc., as required to completely cool engine system.
  3. The engine shall discharge water to air cooled radiator by centrifugal, engine driven pump(s). Provide pressure relief devices as required to prevent excessive pressure increase after engine stops.
  4. Radiator capacity and cooling characteristics shall be designed to cool engine discharge liquid adequately for an engine to carry rated load with 120°F. ambient air at the radiator intake and 0.5" H<sub>2</sub>O fan backpressure.
  5. The radiator shall be mounted to the common engine sub-base, with its fan belt driven from the engine crankshaft. The belting design shall consist of a multi-belt design such that if one belt breaks, the remaining belts shall be capable of operating the engine at its operating speed for an indefinite period.
  6. The fan bearings shall be pre-packed with grease and require no additional lubrication for a period of five (5) years or 10,000 hours of operation.
  7. The radiator shall be copper or brass casing with copper fins with properly sized expansion tank of same material built into its header.
  8. The fan shall be of the pusher type, i.e., the air shall be blown through the radiator.
  9. The lowest points in the water jacket shall be equipped with drains piped to the engine rail and provided with a ball valve with hose connector so that all coolant may be drained from the engine and radiator.
  10. A radiator duct ledge adapter shall be provided to connect to the exhaust plenum.
- B. Provide Engine block Electric heaters, for maintaining the engine coolant temperature at the temperature recommended by the manufacturer of the engine. The temperature should not exceed 90°F. Low Ambient temperature is 20°F.

1. Install thermostatic controls, oil pressure switch and contactors as required to control heaters.
  2. Heaters to operate continuously except while the engine is operating, or the water temperature is above 90°F. Provide a minimum of two (2) 1.5 KW (or larger as required by manufacturer) 208 V or 120 V, 1 PH heaters, one on each side of engine.
  3. Provide isolation valves (2 each heater) on heater connections to allow removal of heater without losing coolant. Valves to be stainless steel ball valves same size as coolant piping to heater.
  4. Pre-wire heaters and controls to engine control terminal box.
- C. Provide engine thermostat with pump bypass to allow engine to warm up quickly.
- D. All main radiator water piping interconnections shall be reinforced silicon rubber hose with double heavy bracket type circle clamps or approved equivalent at each connection. Do not use standard hose clamps. All other hose shall be heavy hydraulic hose as specified herein.
- E. Provide coolant level alarm switches equal to Murphy "Switchgauge" with manual test actuator, to provide shutdown alarm as described herein. Shutdown alarm to initiate after loss of 30% of coolant.
- F. Furnish engine coolant with ethylene-glycol rated coolant with inhibitor (Nalcool or accepted equivalent) to prevent freezing to temperature of -20 degree F. (Approximately 50% solution). Provide specific gravity test and corresponding protection temperature in maintenance manual.

## **2.06 EXHAUST SYSTEMS:**

- A. Use engine-mounted turbochargers driven by the engine gases, securely braced against vibration, and adequately lubricated by the engine's filtered lubrication system.
- B. The exhaust gas emission shall comply with all Federal, State, and Local Emission Codes in force at the location. Information on the content and capacity of exhaust gases emitted by the proposed engine at 25%, 50%, 75% and full loads shall be included in shop drawings.
- C. Exhaust Silencer shall be: Welded steel and chambered, Joints shall withstand 5 psi air test. Rated for Critical grade silencing. Comply with all local ambient noise requirements. Provide bottom inlet-side outlet type as shown. Silencer rated for 1100 F°.
- D. Pressure drop in the complete exhaust system shall be small enough for satisfactory operation of the engine-generator set while it is delivering 100 percent of its specified rating. Furnish a digital manometer permanently installed in the exhaust system on the engine side of the silencer to indicate each pressure.
- E. Manufacturer shall submit a backpressure calculation for the piping and silencer system to verify proper operation with system designed and shown on drawings.
- F. Provide a short (18" long maximum) flexible 300 series stainless steel exhaust section with 125 psi flange type connections installed as close as possible to engine exhaust manifold to isolate engine from the rigid exhaust piping. Provide wye connector in combination with flexible connectors where exhaust manifolds are split with two engine outlets. Provide a 1/2" tap near the exhaust connector to measure the back pressure of the installed system.
- G. All hardware for exhaust system rated 1100 F° including nuts, bolts, washers, gasket materials, blankets, etc. Use 300 series stainless steel bolts, nuts and washers as required to meet temperature requirement.
- H. The Interior Exhaust System, including flexible connection, turbo, manifold, etc., shall be guarded or blanketed to prevent personnel burns. All guards shall be easily removed with standard tools. Blankets

shall be one inch thick, (minimum), one pound density, (minimum), 1200°F, insulating type with eyelets and high temperature glass cord.

## 2.07 START SYSTEM:

### A. Electric Starting:

1. Provide a 12 or 24VDC automatic dual electric starting motor with solenoid and Bendix or overrunning clutch drive, transmitting power to ring gear assembly on flywheel.
2. Provide 24VDC battery system to supply minimum starting ampere rating as recommended by engine manufacturer, except not less than specified below.
3. Provide single string of starting batteries for each engine as follows: (batteries shall be dedicated to each engine and shall not be shared)
  - a. Rating: The engine starting batteries supplied shall be a Lead Acid electrolyte system, designed for high rate discharge and performance, and electrically sized to perform the below specified cycle for a period of 10 years. The battery must be designed for float/stand-by service without excessive maintenance such as electrolyte replacement. It is to have minimum internal resistance, welded construction, be at least 83% efficient on recharge, and have no memory effect. The battery is to be capable of 1000 deep discharge cycles as rated by IEEE. The nominal voltage is 12.0 VPC. The battery design end voltage is 11.00 volts (per cell).
  - b. Sizing Requirements: The battery voltage shall be 12 or 24 VDC, assembled of cells in series for each string. The minimum engine room temperature is 40°F. Provide ampere rating as required to crank engine for 60 seconds continuous cranking time and supply all controls and alarms continuously at 32°F ambient temperature and end cell voltage of 11.0 VPC. Battery system to be minimum of 200 amp hours based on 8 hour discharge rate. Submit calculation (with shop drawings) to verify proper size.
  - c. Cells: Cells must be individual, impact resistant, molded, translucent polypropylene containers. Lids must be heat welded to eliminate seepage at the seams. Electrolyte level indication with minimum and maximum clearly marked on 2 sides.
  - d. Operating Temperature: -40 degrees to +40 degrees C with occasional excursions to 60°C.
  - e. Electrolyte: The electrolyte is to be Sulfuric Acid solution.
  - f. Electrodes: The electrodes are to be of Lead Tin Alloy.
  - g. Vent Cap: The vent cap shall be flame Bayonet type arresting type.
  - h. Connector Bolts and Cables: The battery assembly shall be supplied with intercell connectors of nickel-plated copper solid bar; use stranded copper insulated welding cable inter-step jumpers (as needed) with plated copper lugs which have been pressure crimped; and connection bolts that are stainless steel nickel plated lead or nickel plated steel are not acceptable connector materials. All are to be electrically sized for the maximum current draw of the system to assure minimal voltage drop during the discharge period. Coat all exposed connectors with no-oxide compound.
4. Battery Rack: Battery racks shall be modular design manufactured of at least 3/16" steel for both end sections and rails. They are to be primed and painted in ANSI 61 gray, alkaline resistant epoxy paint. All racks shall be of stepped type, for total visibility and access, and shall be fabricated with pre-cut slots for bolting to floor studs. Battery stands shall be grounded and anchored. Provide continuous non-conductive covers for each row of terminals in rack.

5. Battery Containment: Provide containment tray (open type) capable of containing spill of battery acid.
6. Warranty: For float/stand-by service applications the battery manufacturer shall provide a written 5 year 100% performance guarantee followed by a 5 year prorated warranty totaling 10 years.
7. Acceptable Battery Manufacturers:
  - Optima Batteries Inc. Optima "Blue Top" 12VDC Acid Battery.
  - Saft
  - C&D
8. Provide battery charger to maintain each battery string at full charge.
  - a. Charger to operate from normal or emergency power source and provide minimum 20 amps of D.C. charging current. Charger to recharge 100% duty cycle discharge in eight (8) hours on high rate, 10 ampere DC minimum. Submit calculation for charger with shop drawings.
  - b. Furnish automatic high and low rate (float) charger equalization circuit. Provide manual high rate switch and 24 hour equalize timer.
  - c. AC Power on open green LED.
  - d. High rate charge amber LED.
  - e. Fused AC input and DC output.
  - f. Provide ammeter to indicate charge rate.
  - g. Provide voltmeter to indicate battery voltage.
  - h. High voltage alarm and red LED.
  - i. Low voltage alarm and red LED.
  - j. Float charge indicator green LED
  - k. Designed to prevent damage during engine cranking (cranking circuit disconnect relay where required).
  - l. Provide with failure summary relay and red LED for DC failure, AC input failure and rectifier fail conditions.
  - m. Battery charger – La Marche A12B set for Lead Acid batteries with accessory 16D or accepted equivalent. Wall/floor mounted; input voltage 208 volts, 1 phase. NEMA 1 enclosure or as required for ambient conditions.

## **2.08 MISCELLANEOUS ENGINE PROVISIONS:**

- A. Provide control equipment to include solid state, microprocessor based controls meeting the requirements specified below, and the published standard product of the engine manufacturer.
- B. The voltage regulator with its accessories shall be installed on the GenSet, along with the governor controller and its accessories.
- C. Provide manufacturer's standard remote annunciator (NFPA 110 compliant) to be mounted inside control room.

D. The controls shall contain at a minimum: A Digital controller with alarms listed below is acceptable

1. Operation selector switch (automatic, off/reset, manual, test)
2. Voltmeter, and switch (7 position, including off)
3. Ammeter, and switch (4 position, including off)
4. Frequency meter
5. Wattmeter
6. Emergency stop switch
7. Cabinet heater with thermostat to prevent condensation
8. Engine instrumentation as specified below:
  - a. Engine fuel pressure
  - b. Engine outlet coolant temperature
  - c. Engine inlet coolant temperature
  - d. Engine lube oil pressure
  - e. Engine running hour-meter
  - f. Engine lube oil temperature
9. Air filter restriction gauge

E. The above instrumentation may be provided as a microprocessor-based multifunction meter.

F. The repetitive accuracy of the parameter monitors shall not exceed the following limits:

1. Voltage Monitors + 2% of set point
2. Current Monitors + 3% of set point
3. Frequency and Speed Monitors + 0.2 Hz
4. Power Monitors + 3% of set point
5. Temperature Monitors + 3% of set point
6. Repetitive accuracies shall be as stated over an environmental temperature range of 0 degrees C to 50 degrees C and voltage range of 70% to 110% of nominal. Overspeed monitor shall trip at 115% maximum.

G. All monitors and sensors shall be calibrated before specified field testing.

H. Accessory equipment shall be provided on the control cabinet as follows:

1. Alarm lamps for alarms as described below: A digital control panel with the alarms listed below is acceptable
  - a. Alarm for low lubricating oil pressure shutdown (Major - Red)
  - b. Pre-alarm for low lubricating oil pressure shutdown (Minor - Amber)
  - c. Alarm for high coolant temperature shutdown (Major - Red)
  - d. Pre-alarm for high coolant temperature (Minor - Amber)
  - e. Engine overspeed (Major - Red)
  - f. Engine overcrank (Major - Red)
  - g. Under/over voltage (Major - Red)
  - h. Under/over frequency (Major - Red)
  - i. Low coolant level alarm (Major - Red)
  - j. Low coolant temperature alarm (Minor - Amber)
  - k. Pre-alarm for low coolant level (Minor - Amber)
  - l. Low start battery voltage (Rectifier Fail - Red)
  - m. Start Battery power fail (Major - Red)
  - n. Alarm horn
  - o. Alarm horn silencing switch

- p. Emergency stop button (On Set & Remote)
  - q. Lamp test
  - r. Engine Run (Status - White)
  - s. Generator Breaker Open (Major - Red)
  - t. Controls Not in Auto (Major - Red Flashing)
  - u. Microprocessor Failure Alarm (Major - Red)
  - v. Engine Start signal received (Status - White)
- I. All alarms and controls shall be cabled to terminal strip(s) and mounted in the engine control enclosure. All alarms and controls are to be stenciled on the terminal strip for ease of cross-connection by electrical contractor. In addition to those required elsewhere, provide one dry contact 120VAC, 10A rated (Form C) to terminal strip for each alarm for Owner's use.
- J. The control circuit shall contain 12 or 24 volt alarm lamps energized by the engine protective devices. A 12 or 24V lamp (engine overcrank) shall be energized if the engine has not started by the end of the final cranking period. A green lamp shall indicate when the selector switch is in the "automatic" position.
- K. All lamps shall be LED type.
- L. Automatic Engine Start/Stop Control System:
1. The engine-generator starting circuit shall provide automatically a minimum of 4-15 sec cranking cycles for a total 60 seconds cranking.
- M. Operation shall be initiated by the closing of customer supplied dry contacts (ATS). Provide engine start terminals on terminal strip for Owner's use.
- N. The engine shall not be capable of restart after a cranking period has been completed until the automatic start/stop switch has been reset by turning the switch to the off/reset position.
- O. The automatic start/stop switch shall include the positions of:
1. Automatic: In this position the system shall be capable of sensing a power failure via relay or dry contacts and starting the engine-generator. Typically, a separate system (ATS) will transfer the load from normal to standby power. Upon return of commercial power, typically a separate system (ATS) will retransfer the load back to commercial power and open the engine start dry contacts. Upon opening engine start dry contacts, generator control system will cool down engine (adjustable time) and shutdown.
  2. Off/Reset: The entire control circuit shall be deactivated, and devices reset except the "Switch off Normal" lamp which shall be lighted to indicate an off normal condition. If the set is operating and this switch is moved to the off/reset position, the engine-generator circuit breaker shall shunt trip and shut down the set.
- Manual: Initiates starting of the engine-generator and running, regardless of state of engine start contacts.
- P. Provide exhaust manifold with drilled and tapped holes for exhaust pyrometer (plugged) and covered with 2" thick, 8 pound density, 1200°F. insulating blanket, Hitco or accepted equivalent. Provide blanket with eyelets and sew blankets to engine with high temperature glass cord.
- Q. Provide industrial grade, metal enclosed air cleaner: Size and type as recommended by engine manufacturer. Provide connections and sensor for air restriction gage. Air cleaner elements shall use replaceable dry elements. Special tools shall not be required.
- R. Provide manual reset electric emergency shutdown using air box damper where available as option from manufacturer, for use with remote emergency stop switches to shut down engine. Provide alternative

electrically operated positive shutdown means if air box damper is not available. Do not use emergency shutoff for normal engine shutdown functions.

- S. All flexible piping installed on the engine by the manufacturer, packager for lube, fuel oil and water shall be heavy wall hydraulic hoses rated 300 psi. Connect with hydraulic crimp type, screw pattern connectors. Temperature rating of hose and connectors shall be 50°F higher than the highest expected temperature of the fluid carried by the pipe.
- T. Provide Owner communications interface via Modbus RTU protocol, Ethernet TCP/IP, RJ45 connector to obtain all Generator and fuel data.

## **2.09 ALTERNATOR: (Low Voltage)**

- A. The alternator shall be synchronous, self-ventilated, drip proof construction, single-bearing rotating-field type with PMG pilot exciter or series boost exciter connected directly to the engine. Provide flexible type coupling connection to engine to prevent accidental damage of engine or alternator shaft for positive alignment.
- B. The alternator shall be designed for convenient connection to and removal from the engine. Provide lifting eye(s).
- C. The alternator windings shall be copper, designed for good wave shape and low noise level. Output shall not deviate from standard sine waveform more than +5%. Telephone influence factor (TIF) shall be less than 50 based on 1961 weighting curve. The alternator open circuit terminal voltage deviation factor shall not exceed 0.06.
- D. The deviation factor for the alternator open circuit voltage shall not exceed 6% as determined by IEEE Test Code 503.
- E. Provide amortisseur windings integral with the rotor coil support.
- F. The alternator winding pitch shall be the standard of the manufacturer, but not less than 2/3, all generators to have same pitch. Submit generated harmonic analysis for 3rd, 5th, 7th, 9th, and 11th harmonics. No single harmonic shall exceed 3%, and the total harmonic content shall not exceed 5% THD, line-to-line or line-to-neutral. Where alternators are connected in parallel with other alternators, all alternator winding pitches shall be the same.
- G. Winding insulation Class F with maximum winding temperature rise of 105°C. above 40°C. ambient and altitudes of up to 1500 feet. Submit de-rating data for altitudes above 1500 feet. Basic Impulse Rating (BIL) of insulation shall be 7.5 KV minimum.
- H. Winding insulation system shall utilize a heavy film insulation material. After completion of the coil winding insulation process, the entire coil assemblies shall be vacuum pressure impregnated with thixotropic epoxy resin designed for good bonding quality, slot fill, and winding rigidity to produce a void free insulation system. Insulation and mechanical parts shall have minimum 10,000 hour life at full load. Insulation shall have 30 year shelf life minimum.
- I. Upsized Alternator rated 150 KW at 0.8 power factor, 120/208 volts, 3 phase, 4 wire, 60 hertz, (wye) delta connected, 12 lead re-luggable to all winding configurations, for application of different voltages as shown. Alternator capable of 150% overload for one (1) minutes without damage.
- J. Alternator shall withstand short circuit currents (phase to phase, 3 phase, or phase to neutral) in conformance with NEMA Standards without damage to alternator. Alternator shall be designed to deliver 300% current for 10 seconds without damage. The alternator short circuit capability shall meet the requirements of ANSI C50.10 and NEMA MG-1.



- K. Provide closely applied MOV surge arresters as recommended by generator manufacturer. to protect generator from lightning and/or switching surges. Mount arresters in terminal connection box.
- L. Alternator shall withstand 125 percent of the RPM specified for the set without damage. Submit certification.
- M. Alternator bearings shall be the shielded type with a minimum designed L-10 service life.
- N. Efficiency shall be not less than 95 percent for entire load range.
- O. In addition to any requirements of the NEC: Nameplates attached to the generator and exciter to show manufacturer's name, equipment identification, serial number, voltage ratings, field current ratings, KW/KVA output ratings, power factor rating, time rating, temperature rise ratings, RPM ratings, full load current rating, number of phase and frequency, and any field connection and multiple storage requirements.
- P. Alternator shall be complete with terminal box properly sized for breaker, braced bus bars and adequate space for proper cable terminations. Provide set mounted 100% continuous current rated case thermal magnetic generator output circuit breaker rated 600 volts, with minimum interrupting rating of 30,000 amps at 480 volts with adjustable short time, long time and instantaneous and 24 or 12 VDC shunt trip coil to open breaker on engine/generator fault. Breaker terminals shall be bus bars to accept multiple sets of 2 hole compression lugs for cable bus as shown on drawings. All exposed terminals and wiring shall be insulated with 600 volt heat shrink insulation material as manufactured by Raychem.
- Q. Acceptable Generator Manufacturers:
  - Ideal
  - Caterpillar
  - KATO
  - Kohler
  - Newage
  - Cummins

## 2.10 VOLTAGE REGULATOR:

- A. Voltage regulator shall be an integral part of the engine control system and maintain voltage within limits as specified below:
  - 1. Stability: +2.0% maximum voltage variation at any constant load from no load to full load including a  $\pm 2-1/2\%$  frequency deviation.
  - 2. Regulation: +2.0% maximum voltage deviation between no-load steady state and full-load steady state including a  $\pm 2-1/2\%$  frequency deviation.
  - 3. Transient: 20% maximum voltage dip on one-step application of 0.8 power factor 100% load with a recovery time of less than 7.0 seconds.
  - 4. Transient: 25% maximum voltage dip on sequential loading in 33% (assume 33% of set rating) with 25% pre-load). Recovery time shall be less than 4.0 seconds or 60% of each step time interval whichever is less.
  - 5. Transient: 2.5 seconds maximum voltage recovery time with removal of 0.8 power factor full load.
- B. Regulator to be 3 phase sensing with regulator current limit control with necessary current transformers, etc. to prevent regulator runaway.

- C. Provide connections for remote voltage adjustment (motorized potentiometer as required installed in Generator Control Panel). Minimum range of adjustment at no load and 60 hertz shall be + 10%.
- D. Regulator-generator system with necessary devices to restrict the radio interference to limits of military specifications STD-461A.
- E. Acceptable regulator manufacturers:

- Basler
- Caterpillar
- KATO
- Cummins/Onan
- Newage
- Kohler

### 2.11 ENGINE MOUNTING:

- A. Mount engine, radiator and generator on steel beams, size as required, to prevent excessive flexing and vibration between components. Submit torsional analysis for review.
- B. Provide cast semi-steel vibration isolators between generator mounting beam and floor slab as required to damp 97% of Generator set vibration. Isolators shall have fully adjustable snubbers and synthetic rubber snubber inserts. Provide internal leveling adjustment. Base of isolator provide with sound pad. Vibration isolators shall be Korfund Type LIE or accepted equivalent. Provide mounting top bolt arrangement as required to allow bolting to generator beam.
- C. Provide springs, restraints, and snubbers as required to meet requirements of Seismic zone specified herein.
- D. Acceptable Vibration Isolator Manufacturers:

- Korfund
- ACE Mountings
- Kinetics

### 2.12 PAINT:

- A. Entire engine-generator assembly shall be painted with two (2) coats manufacturer's standard color after fabrication is complete.

### 2.13 ENGINE CONTROL AND POWER WIRING:

- A. All control and power wiring shall be rated for temperature to which it is exposed, but rated not less than 105°C, and color coded and laced. Provide contractor with type and quantity of conductors required between Generator and control panel (with 10% spares minimum) and coordinate their installation as required.
- B. Color Code:
  - 1. White - CT Leads
  - 2. Blue - DC Control
  - 3. Red - AC Control
  - 4. Yellow - AC Power
  - 5. Green - Ground

- C. All wiring connections made with insulated, long barrel, locking fork compression, dual crimp type terminals, T&B "Stakon" or accepted equivalent.
- D. Each wire shall be identified with permanent PVC or vinyl wire markers T&B type WSL self-laminating or accepted equivalent at every break, (i.e., terminal strip, relay, control device, etc.). All terminals shall be permanently identified with vinyl or Bakelite markers. All devices shall be identified with Bakelite nameplates located in readable location and fastened with screws.
- E. Provide grounding lug plates on each side of engine rails and one 1/4" x 4" ground bus in the terminal box pre-drilled for standard 2-hole compression lugs.
- F. The manufacturer shall coordinate the interfacing of the engine mounted controls system with all related equipment supplied in accordance with other sections of the project.

**2.14 SIGNAGE:**

- A. Provide signage on engine required for proper operation and any code required signage where danger exists. In addition, provide a sign on the rear of each engine-generator indicating the engine-generator number reference and that unit is auto start. Signage shall have 2" high letters reading "ENGINE NO. \_\_\_\_, DANGER - AUTOMATIC START".

**2.15 GENERATOR ENCLOSURE**

- A. Sound Attenuated: Enclosures shall be painted aluminum, 14-gauge construction, with stainless steel hardware. Doors shall be weather-protective seals; keyed and pad-lockable. Non-hydroscopic sound-insulating materials. The enclosure shall reduce source noise an average of 30db at one meter. The panel openings shall be designed so as not to allow wind-driven rain to enter the enclosure and cause damage to the unit while in operation. The enclosure shall be designed to withstand 110 mph wind speed.
- B. Enclosure shall also be designed with removal louvers for servicing generator. Generator enclosure to house battery tray, battery charger, generator circuit breakers. All electrical controls shall be contained within the enclosures. Intake louver shall be electric motor operated (fail open) dampers and radiator discharge shall have back draft dampers.
- C. Provide radiator fill (roof), oil drain, and coolant drain to enclosure exterior, capped with valve inside of the enclosure.
- D. Provide 120V AC and 12 or 24V DC (timer) LED lighting enclosure, Electric heater 208V, 1 PH, 2 GFCI receptacles, and spill containment around GenSet unit with spill alarm annunciated at control panel and minor alarm contact. Provide 2 fire extinguishers, and exhaust fan 208V, 1 PH with timer and thermostat.

**PART 3 - EXECUTION**

**3.01 FACTORY TEST:**

- A. The Owner shall have the option of witnessing the following tests at the factory. All expenses for the Owner's representative trip to witness these tests will be paid by the Owner. Submit detailed step-by-step testing sequence 30 days prior to test date for Engineers review and approval. Notify the Owner 30 days prior to day of testing. Furnish load banks, fuel, transformers, starting battery, testing instruments and all other equipment as necessary to perform these tests.
  - 1. Load Test: Shall include minimum of four (4) hours of continuous operation for each engine-generator while the set is delivering 100 percent of specified KW with 0.8 Power factor at 105°F. ambient temperature. During this test, record the following data at 15-minute intervals:

Time	RPM	Fuel Pressure
KW Output	Water Temperature In	Oil Pressure

Output Voltage	Water Temperature Out	Ambient Temperature
Oil Temperature	Inlet Air Temperature at Radiator	

2. Test all engines and alternator safeties and calibrate prior to test.
3. Quick Start Test: Record time required for the engine alternator set to develop specified voltage, frequency, and kw load from a cold standstill condition.
4. Block Loading Test: 50%, 75% and 100% of full load, with measured response.
5. Sequential Loading Tests: 33% steps to full load with measured response.
6. Provide recording voltage and frequency analyzer acceptable to Owner/Consultant to measure and record all tests. The following accuracy is required:
  - a. Output voltage, line-to-line on each phase, measured to an accuracy of +/- 1.0 percent.
  - b. Output current, each phase measured to an accuracy of +/- 1.0 percent.
  - c. Output KW, measured to an accuracy of +/- 2.0 percent.
  - d. Coolant temperature, to an accuracy of +/-1.0°F.
  - e. Oil pressure, to an accuracy of +/- 1.0 percent.
  - f. RPM of generator or frequency of output to an accuracy of +/- 3 RPM or +/- 0.1 Hz, respectively.
  - g. Fuel pressure, to an accuracy of +/- 1.0 psi.
  - h. Ambient temperature, accuracy +/- 1.0°F.
  - i. Time meter, accuracy +/- minute.
  - j. Barometric pressure, accuracy +/- 1.0" Hg.
  - k. Provide certified copy of all test sheets to the Owner at the completion of tests.

### **3.02 INSTALLATION:**

- A. Install engine-generator on vibration isolators on isolated concrete or structural pad as shown on drawings. Bolt isolators to pad. Bolt top isolator pad to engine rail. Adjust isolator dampers.
- B. Connection of all fuel, exhaust, air, lube oil, cooling system, batteries and chargers, ventilation, and lube equipment for complete proper operation of engine and generator to be performed and the electrical/mechanical contractors.

### **3.03 ENGINE-GENERATOR FIELD LOAD TEST:**

- A. Conduct field load test on each new engine-generator supervised by manufacturer, Owner's representative, and design consultant. Eight hours of continuous operation with 1/2 hour at 50% load, 1/2 hour at 75% load and 7 hours at 100% of the generator KW load rating at rated voltage and frequency.
- B. Verify all engine generator control functions, alarms, (remote and local), and all safety shutdowns and pre-alarms.

- C. Furnish load testing load banks with 10-20 percent additional capacity and apparatus, step down transformers, connections, room heaters, etc., for tests. Provide instrumentation to record room ambient temperature, intake air temperature, and radiator ambient air temperature during load test.
- D. Record all quantities, temperatures, etc. same as factory test above. Also record exhaust back pressure, battery charger voltage and current and any fluid leaks. Recording instruments same as described above for factory tests.
- E. Repeat quick start and block load tests same as factory test specified above.
- F. If the test are stopped for any reason, repeat entire 8-hour test until satisfactory results are obtained.
- G. The Contractor shall furnish fuel for tests and start up.
- H. Owner/Consultant to witness tests. Four weeks' notice required. Detailed testing sequence (similar to factory test) required 30 days prior for Engineers review and approval.
- I. After the generators have been load bank tested, perform a complete facility emergency system load test with available system load for a minimum of 2 hours continuous.
- J. Perform all tests at rated voltage and frequency.
- K. All tests shall be reported by the manufacturer's representative and furnished to Owner at the conclusion of the testing. Provide a typed copy of the test reports to the Owner within 5 working days.

#### **3.04 ELECTRICAL TESTS:**

- A. After field testing engine-generator sets each generator shall be D.C. high potential tested phase to phase and phase to ground and polarization index determined.
- B. Test voltage shall be as recommended by alternator manufactured but not less than 2 KV. Use D.C. high potential tester, as manufactured by J.C. Biddle or accepted equivalent. Test equipment used capable of producing minimum specified voltage plus 25% additional voltage.
- C. Provide constant voltage power supply for tester. Testing technician shall be trained in High Potential testing. Submit qualifications to Consultant for review. Consultant may reject unqualified testing technician.
- D. Test interval - 5 minutes. Graph leakage values in microamperes vs. time with values plotted each 30-60 seconds. Test to be discontinued and reported if erratic results are observed. Test records include date, ambient temperature, relative humidity, and time of day.

#### **3.05 RECORDING GENERATOR SET QUALIFICATION AND PERFORMANCE TESTING:**

- A. The following procedures shall be utilized in the Qualification and Load Testing of the Generator Set, Control Panel, and Transfer Switch at the site after the installation is complete. Tests are described above.
- B. General:
  - 1. Testing procedures which are included, or attached, incorporate the standard methods, required for the qualification and performance testing of the engine-generator set(s) and control(s) installed.
  - 2. Resistance load bank testing shall be continuous 8 hour load testing as specified herein.
  - 3. Testing procedures are valid and approved, only for testing conducted in accordance with this document and, using the standard load banks and testing equipment approved for this purpose.

4. Testing will be witnessed by a representative of the Owner or Consultant's or both who will review all test results. The Contractor or their representative or both shall witness these tests, document, and certify the results.
5. Testing of all equipment will be under the direction of the generator manufacturer and Owner's Representative. During periods of actual performance and load bank testing of equipment, all personnel witnessing the tests will be under the direction and supervision of the Contractor who will be responsible for the performance of all tests. Any person not adhering to safety directives will be required to leave the testing area or all testing may be halted or both.
6. In addition to the listed testing procedures, copies of the attached test logs are to be completed by the Contractor with all test data, and the original of the test logs shall remain in the Owner's or Consultant's property before, during and after each test.
7. Any discrepancies, failures or problems encountered are to be reported to the Owner or Consultant immediately, before proceeding.
8. All corrective action taken must be approved by the Contractor and reviewed by the Owner or Consultant and must be documented and forwarded to the Owner or Consultant.
9. All operating parameters are to be monitored and recorded at outlined intervals during periods of load testing.
10. Testing and qualification procedures are to be in compliance with engine company testing methods for commercial AC generator sets to accomplish tests specified herein as accepted by the Consultant/Owner.

C. Test Ratings:

1. The generator set(s) shall be tested resistive load banks, at unity power factor (PF), and at a minimum amperage determined as follows:

$$\text{AMPERES} = \frac{\text{KW} \times 1000}{\text{volts} \times 1.73 \times \text{PF}}$$

D. Each test log sheet shall include the following information from the generating system tested:

1. Engine-Generator Set Model Number.
2. Engine Serial Number.
3. Generator Model Number.
4. Generator Serial Number.
5. Generator Make or Manufacturer.
6. Voltage Regulator Model Number.
7. Voltage Regulator Serial Number.
8. Voltage Regulator Make or Manufacturer.
9. Control Panel Model Number.
10. Control Panel Serial Number.

11. Control Panel Make or Manufacturer.
12. Governor Model Number.
13. Governor Serial Number.
14. Governor Make or Manufacturer.
15. Customer Name and Job Identification.

E. Automatic Start Cranking Test:

1. Interconnect control panel to engine per the appropriate wiring diagram.
  - a. Shutoff fuel supply.
  - b. Turn selector switches to "RUN" position and initiate "Start".
  - c. Check "CRANK" time delay relay per specifications.
  - d. Check "REST" time delay relay per specifications.
  - e. Check "OVERALL CRANK" time delay relay per specifications.
  - f. After time delay relays are checked, run complete crank cycle test.
  - g. Verify that at the end of crank cycle test, overcrank failure occurs and that the overcrank light is energized and alarm sounds.
  - h. Turn selector switch to "off" position - engine should stop.
  - i. Turn on fuel valve supply and prime engine if required.
  - j. Turn selector switch to "MANUAL" position. Engine should start and accelerate to rated speed.
  - k. Turn selector switch to "OFF" position. Engine should stop.
  - l. Turn selector switch to "MANUAL" position to restart engine.
  - m. With engine running, follow procedure below to simulate an engine failure with each engine mounted (shutdown type) safety control.
    - n. Overspeed switch (simulate condition).
    - o. Water temperature switch (simulate condition) alarm and pre-alarm.
    - p. Oil pressure switch (simulate condition) alarm and pre-alarm.
    - q. Low water level (simulate) alarm and pre-alarm.
  - r. Determine that auto-start cranking panel will shut down engine, energize appropriate fault lamp and lock out panel against re-start until the selector switch has been manually rotated to the "STOP" position, and reset.

F. Safety Control Test:

1. Test and record the operation of all engine mounted safety devices.

2. Oil pressure switch: With engine running, close valve in line to oil pressure gauge/oil pressure switch. Place engine start switch in "OFF" position. After engine comes to rest, bleed pressure. As engine oil pressure decays, determine when the oil pressure switch contacts open/close. Record value of oil pressure at this point in psi. Open valve to full open after test.
3. High water temperature switch: With engine running, over-ride water temperature switch. Determine that engine shuts down.
4. Engine overspeed: Increase engine speed until overspeed contacts open and engine shuts down.
5. Low Water Temperature Switch (with engine stopped).
  - a. Verify that the appropriate control panel or annunciator panel indicating lamp, or both are illuminated, and the alarm horn is activated.
  - b. Verify that the silence switch(es) deactivates the alarm horn.
6. Low Water Level Switches: Operate contacts with external operation and verify shutdown and pre-alarms and verify coolant to determine pick-up of shutdown switch.

G. Load Bank Test:

1. Load bank test the engine-generator set at the ratings and time periods listed below. Record all operating parameters at indicated intervals.
2. Install a single pole switch across generator remote start contacts (transfer switch controls may be used).
3. Place generator panel controls in the Automatic Start position.
4. Close single pole switch in Item B, time and record the interval required for the engine to start, accelerate to speed and to apply resistive load bank load.
5. Apply 50% of load for first 30 minutes, 75% load for next 30 minutes. Apply 100% rated resistive load for 7 hours. Monitor and record all operating parameters at indicated intervals.
6. Remove all load and operate engine unloaded for 5 minutes or until pressures and temperatures stabilize.
7. Shut down engine.

H. Building Load Test (If allowed by Owner, MOP required):

1. After generators have been load bank tested, the Contractor shall perform a complete emergency system load test with available building load. The generator(s) shall pick up and carry this load at rated operating voltage and frequency. This load test shall be performed on all generators provided. When the building is operational and each piece of electrical equipment requiring generator power is operation the Contractor shall perform 1 hour load test utilizing all building equipment for the load.



**GENERATOR FULL LOAD TEST FORM**

GENERATOR SET NO.: \_\_\_\_\_  
 OUTSIDE TEMPERATURE: \_\_\_\_\_  
 WEATHER CONDITIONS: \_\_\_\_\_  
 INSIDE TEMPERATURE  
 (BEFORE TEST): \_\_\_\_\_  
 DATA TAKEN BY: \_\_\_\_\_

SERIAL NO. \_\_\_\_\_  
 DATE: \_\_\_\_\_

	Time	ROOM TEMPERATURE		ENGINE				BATTERY CHARGER		LOAD			
		AMBIENT	@ RAD.	OIL		WATER		VOLTS	AMP S	VOLTS	AMP S	KW	RPM/ FREQ
				FUEL PRESS	TEMP	PRESS	TEMP IN						
START													
+5 MIN													
+10 MIN													
+15 MIN													
+30 MIN													
+45 MIN													
+60 MIN													
+75 MIN													
+90 MIN													
+105 MIN													
+120 MIN													
+135 MIN													
+150 MIN													
+165 MIN													
+180 MIN													
+195 MIN													
+210 MIN													
+225 MIN													
+240 MIN													
+255 MIN													
+270 MIN													
+285 MIN													

+300 MIN														
+315 MIN														
+330 MIN														
+345 MIN														
+360 MIN														
+375 MIN														
+390 MIN														
+405 MIN														
+420 MIN														
+435 MIN														
+450 MIN														
+465 MIN														
+480 MIN														

INSIDE TEMPERATURE AFTER TEST: \_\_\_\_\_

**GENERATOR FULL LOAD TEST FORM**  
**(CONTINUED)**

I. PREVENTS SET FROM STARTING RUN COMPLETE CRANK/REST SEQUENCE BY SETTING CONTROL SWITCH TO RUN.

BATTERY VOLTAGE: \_\_\_\_\_ PASSED FAILED

SEQUENCE SPECIFIED:

[\_\_\_\_\_] - [\_\_\_\_\_] SEC. CRANKS W/[\_\_\_\_\_] SEC. RESTS BETWEEN PASSED [\_\_\_\_\_] FAILED [\_\_\_\_\_]

BATTERY CHARGE RATE: VOLTS:\_\_\_\_\_ AMPS:\_\_\_\_\_

II. TEST SAFETIES:

P = PASSED F = FAILED

ALARMS	LOCAL	REMOTE	
LOW JACKET WATER TEMP.	_____	_____	_____
HIGH WATER TEMP.	_____	_____	_____
LOW LUBE OIL PRESS	_____	_____	_____
THREE HOUR MAIN FUEL SUPPLY	_____	_____	_____
BATTERY CHARGER FAILURE	_____	_____	_____
BATTERY	_____	_____	_____
OVERSPEED	_____	_____	_____
OVERCRANK	_____	_____	_____
LOW WATER LEVEL	_____	_____	_____
LOW WATER LEVEL PRE-ALARM	_____	_____	_____
HIGH WATER TEMP PRE-ALARM	_____	_____	_____
LOW OIL PRESSURE PRE-ALARM	_____	_____	_____
ENGINE RUNNING SENSOR	_____	_____	_____
OIL PRESSURE DROP-OUT _____ PSI			

**GENERATOR FULL LOAD TEST FORM**  
**(CONTINUED)**

III. TEST "COLD" START (DISCONNECT POWER TO TRANSFER SWITCH)

GENERATOR SET NO.: \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

OUTSIDE TEMPERATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

WEATHER CONDITIONS: \_\_\_\_\_

INSIDE TEMPERATURE: \_\_\_\_\_

TIME FOR LOUVERS FULL OPEN. (8 SEC. MAX) \_\_\_\_\_ SEC.

TIME DELAY ON POWER FAILURE TO CRANK \_\_\_\_\_ SEC.

CRANKING TIME TO START \_\_\_\_\_ SEC.

TIME TO OPERATING SPEED (60 HZ) \_\_\_\_\_ SEC.

TIME TO TRANSFER ALL IMMEDIATE TRANSFER SWITCHES \_\_\_\_\_ SEC.

TIME DELAY TRANSFER SWITCHES TRANSFER AFTER TIME DELAY

YES NO

VOLTAGE OVERSHOOT \_\_\_\_\_

FREQUENCY OVERSHOOT \_\_\_\_\_

OIL PRESSURE \_\_\_\_\_

WATER TEM \_\_\_\_\_

BATTERY CHARGE RATE: VOLTS \_\_\_\_\_

AMPS \_\_\_\_\_

GENERATOR # \_\_\_\_\_

DATE \_\_\_\_\_



**SECTION 26 3623.16**  
**AUTOMATIC TRANSFER SWITCH DELAYED TRANSITION**

**PART 1 - GENERAL****1.01 SCOPE**

- A. Automatic Transfer Switch, and installation.

**1.02 STANDARDS**

- A. Transfer switches shall comply with latest edition of:
  - 1. NFPA 110      Emergency and Standby Power System
  - 2. NFPA 70      National Electrical Code
  - 3. UL 1008      Automatic Transfer Switches
  - 4. NEMA ICS10   AC Automatic Transfer Switches

**1.03 SUBMITTALS**

- A. Submit complete shop drawings showing elevations, details, wiring diagrams, materials list, accessories, etc. for review before fabrication.
- B. Shop drawings to include:
  - 1. Front, rear and end views of the transfer switch with material list and nameplate schedule.
  - 2. Sectional view showing construction, size and location of bussing and cabling furnished.
  - 3. Schematic and Physical Wiring Diagrams for transfer switch controls, and accessories.
  - 4. Complete detailed instructions for operation and sequences.

**1.04 SEISMIC REQUIREMENTS**

- A. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.

**1.05 RELATED WORK**

- A. Section 26 2300 - Switchgear
- B. Section 26 3213.19 – Natural Gas Engine Driven Generator Sets

**PART 2 - PRODUCTS****2.01 AUTOMATIC TRANSFER SWITCH**

- A. The Transfer Switch shall be rated 600 volts, with a withstand current rating of 22,000 amperes at 208 volts, coordinated with circuit breakers. The transfer switch shall be fixed mounted.
- B. The Transfer Switch shall be mechanically held, electrically operated, rated for continuous loads.
- C. All bussing in the transfer switch(es) shall be silver plated copper bus the size based on 65°C rise above 40°C ambient except minimum 1000 amperes/square inch, with fully overlapped joints.

- D. Transfer Switch(es) shall be 3 - pole using silver alloy wiping copper contacts (use segmented contacts over 600 amperes) and separate arcing tips and/or contacts.
- E. Transfer switches(es) shall be rated for all classes of load.
- F. Transfer Switch Sensing and Controls may be microprocessor based and/or relay logic. Relays shall be continuous duty, industrial type with minimum contact rating of 10 amperes with LED pilot indicating operation with dust cover and retention clip. Controls shall be the latest standard product of the transfer switch manufacturer to provide functions listed below.

## **2.02 TRANSFER SWITCH CONTROL SYSTEM:**

- A. The control module shall direct the operation of the transfer switch. The module's sensing and logic shall be a built-in microprocessor-based system for maximum reliability, minimum maintenance, and inherent digital communications capability. The control settings shall be stored in nonvolatile EEPROM or accepted equivalent. The module shall contain an integral programmable clock and calendar. The control module shall have a keyed disconnect plug to enable the control module to be disconnected from the transfer mechanism for routine maintenance.
- B. The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover as specified above.
- C. The control module shall include programming keypad, alpha-numeric display for monitoring settings and diagnostic values, key-lockable program selector switch, light-emitting diode status indication, and user instructions. These features shall be user accessible when the enclosure door is closed.
- D. The control module shall be capable of storing the following records in memory for access either locally (at the control module) or remotely (at a computer):
  - 1. Number of hours transfer switch is in the emergency position (total and since record reset)
  - 2. Number of hours the emergency is available (total and since record reset)
  - 3. Total days that control has been energized (total and since record reset)
  - 4. Total transfers in either direction (total and since record reset)
  - 5. Date of record reset.
  - 6. Date of last exercise period.
  - 7. Date, time, and description of the last four source failures.
  - 8. Elapsed time during the most recent source outage.

## **2.03 OPERATION**

- A. Source Voltages
  - 1. The voltage of each phase of the normal source and a single phase of the emergency source shall be monitored with pickup adjustable from 75% to 100% and dropout adjustable from 70% to 95% of nominal.

2. An automatic minimum differential of 2% shall be maintained between pickup and dropout settings.
  3. Repetitive accuracy of the setting shall be  $\pm 2\%$  or better over an operating temperature range of  $-20^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-29^{\circ}\text{C}$  to  $65.5^{\circ}\text{C}$ ).
  4. The settings shall be fully field-adjustable by keypad or keyboard (local or remote) in increments of 1 Volt without opening the enclosure door and without the use of special tools or separate meters.
  5. Factory settings shall be pickup at 95% and dropout at 85%.
  6. A light-emitting diode shall indicate that normal and/or emergency voltage is within the set point parameter. The indication shall be viewable when the enclosure door is closed.
- B. Time Delays
- C. The control module shall include four time delays that are fully field-adjustable by keypad or keyboard in increments of 1 second over the entire range.
- D. Adjustments and viewing of the time delay values shall be accessible when the enclosure door is closed.
- E. Light emitting diodes shall indicate when the timing feature is running and when the time delay has ended.
- F. Required Time Delays.
1. Time delay for engine start to delay initiation of transfer for momentary source outages: Range 0-120 seconds. Factory set at 40 seconds.
  2. Time delay for retransfer to commercial: Range 0-60 minutes. Factory set at 20 minutes.
  3. Time delay for engine cooldown: Range 0-30 minutes. Factory set at 5 minutes.
  4. Time delay for contactors open - delayed transition time: Range 0-15 seconds. Factory set at 3 seconds. Provide separate adjustable delay for transition to normal and transition to emergency.
  5. Time delay for transfer to emergency; Range 0-60 seconds to allow switches to transfer to generators in a sequence. Set as directed at start-up.
  6. Input values outside the allowable parameters shall cause a "range error" message to be displayed.
- G. The user shall have the ability to manually program an engine start and run for a period of up to 72 hours in the loaded or unloaded mode of operation. The time delay transfer to emergency and/or normal may be bypassed during the run period. A numeric indication shall be displayed of the run time remaining in hours and minutes. The run period may be stopped at any time with a single key stroke. After the run period has stopped, the engine shall run unloaded for the cooldown time.
- H. User terminals shall be available to connect a normally closed contact that, when opened, signals the control module to start and transfer load to the engine-generator. Closing these contacts shall initiate a retransfer and engine cooldown sequence. The load shall be transferred to an available utility source immediately if the generator source should fail.



- I. The following features shall be built into the control module logic. These features shall be enabled at the factory or in the field by installing an insulated program jumper provided by the vendor as standard.
  1. Extended Time Delay: Allows the time delay settings to be extended to 99 minutes.
  2. Plant Exerciser: Programmable seven day, fourteen day or calendar exerciser. Each exerciser mode shall be capable of performing up to two exercise runs in up to five exercise event periods. The exerciser period shall be programmed with the enclosure door closed. The exercise time may be reset at any time with a single key stroke. The engine shall be allowed to run when the exercise period is terminated.
  3. All phases of normal and emergency shall be monitored for overvoltage, single phase, and over- and under-frequency. The values shall be programmed with the enclosure door closed.
  4. Anti-single phasing protection shall detect regenerative voltage as a failed source condition.
  5. Operation override shall function to bypass any manual switch accessories except "automatic-manual" switch if the source to which the transfer switch is positioned fails and transfer the switch to the active source. This program jumper shall be factory installed.
  6. ATS "Micro Processor Failure Alarm" form "C" contact wired to customer use terminal.
  7. Provide a Proper Operate DPDT contact output status to indicate upon a Utility fail a Gen start was initiated and ATS transferred to Emergency source.
- J. Status Indicators shall consist of light-emitting diodes shall indicate the status of the following:
  1. Contactor Position
  2. System Status
    - a. Transfer Switch Position Sensing Fault
    - b. Transfer Switch Fail to Transfer
    - c. Internal Control Module Fault
    - d. Manual Transfer Operation
    - e. External Fault Condition (two inputs)
    - f. Not In Automatic
    - g. Programming Switch Not In Off
  3. The system status messages shall also be shown on the alpha-numeric display.
- K. A lamp test push button shall light all light-emitting diodes.
- L. The control module shall have a three-position, key-operated, programming control switch. The key shall be removable in any position. The positions shall be:
  1. Off-Allows all enabled accessories to be monitored only. Settings cannot be changed while in this position.
  2. Local-Allows all enabled accessory settings to be changed by local keypad entry.
  3. Remote-Allows all enabled accessories to be altered via the remote communications port.

- M. Provide a two position switch for "automatic-manual" modes. In automatic mode, all functions described herein shall be active. In the manual mode, the switch will ignore all commands to transfer automatically. Provide pushbuttons to transfer ATS between normal and emergency positions manually while operating in this mode. Provide a nameplate to read "Maintain the auto-test switch in the TEST position during manual operation."
- N. Provide Form "C" set of contacts for "not in Auto" to operate when ATS is not in Auto mode, wired to terminal for Owner's use.
- O. Provide a maintained test switch with pilot light (on when test is activated). Transfer switch to bypass test function and return to normal source if emergency source is lost.
- P. A momentary-type test switch shall be provided to simulate a normal source failure, lock this mode until test is reset.
- Q. The transfer switch shall have load-shed and sequencing capability to allow up to nine selected loads to be disconnected prior to transfer in either direction. It shall be possible to vary the time sequence for reenergizing of the nine loads.
- R. Two sets of gold-flashed contacts rated 10 amps, 28 VDC shall be provided for a low-voltage engine start signal when the normal source fails.
- S. Furnish Two (2) extra auxiliary DPDT contacts on Normal contactor and two (2) auxiliary DPDT contacts on Emergency Contactor wired to terminal block for Owner's use.
- T. Provide 2 sets of input terminals for (2) dry contact inputs to function on contact closure, to inhibit ATS from transferring to Emergency (from Normal) and to Normal (from Emergency) position. One input to inhibit ATS such that ATS remains in present position or operates to neutral position is acceptable.

#### **2.04 COMMUNICATION CAPABILITIES**

- A. The transfer switch shall include connections for any of the following network configurations. Interactive software developed for ATS applications shall be included. The software must monitor, allow alteration of values, and provide system diagnostics. All values and indications of the ATS keypad must be available through the networks.
  - 1. Point-to-Point Connectivity
  - 2. Provide connections for the ATS to connect directly to a personal computer or network using Ethernet RJ45 port with Modbus protocol.
  - 3. Provide standard connection to connect a printer to the ATS for hard copy generation.

#### **2.05 SEQUENCE OF OPERATION**

- A. Sequence of Automatic Transfer Operation:
  - 1. When normal (commercial) service drops below the preset percent of rated voltage and remains for a specified time delay, contact closure in the transfer switch will signal the engine-generator to start. When generator output reaches proper voltage and frequency, the transfer switch will transfer load to the generator with a preset pause in the open position, set at 1 second.

2. When normal (commercial) source returns to preset percentage of rated voltage, and after specified time delay, load retransfers to the normal source with a preset pause in the open position, set at 3 seconds.
3. Engine-generator start control shall remain closed to allow the engine-generator to run (unloaded) for preset time after retransfer before shutdown.
4. Control relays, etc., to reset instantaneously, ready for next automatic operation.

B. Sequence of Manual Operation:

1. Auto manual switch in "manual" position with amber LED lighted.
2. No automatic start functions available.
3. Requires manual start of engine generator(s).
4. Requires manual operation of pushbuttons to cause switch to transfer between sources, with preset pause in open position.

## 2.06 ENCLOSURE

- A. Furnish the transfer switch with NEMA 1 painted steel enclosure. Provide bonded 50% ground bus (1/4" x 3" minimum). Enclosure may be wall and/or floor mounted per manufacturer's standard.
- B. Provide device nameplates (breakers, switches, fuses, control devices, etc.) for all devices and mimic bus per Section 26 0553.
- C. Provide 48" wide x 3/16" thick rubber insulating operator mats in front and rear of equipment line-up. The Mat shall be designed to lay flat without curling on ends. DO NOT install with adhesive.
- D. Infrared Windows
  1. Infrared viewing windows to allow the use of an infrared camera, thermal imager, or visual eye inspection direct line of sight to inspect electrical connections without requiring the opening of panels and doors is required. These windows are intended to allow thermographers the ability to inspect the electrical equipment without directly exposing themselves to live electrical components and energized devices. Provide quantity and locations of viewing windows to allow inspection of all power bus and cable connections but 3 windows minimum per section at locations selected by Engineer.
  2. All windows shall allow infrared scanning using LW or SW cameras with the universal range from 0.3um – 13um, visual inspection and thermal imaging, 4mm thickness coated crystal, metal frame assembly, no screws lock ring mounting assembly, protective removable cover with retaining function, and as a minimum comprise of the following:
    - a. All metal construction (plastic is not acceptable).
    - b. Crystal shall be 100% optically transparent.
    - c. Removable locking security cover incorporating a retaining mechanism.
    - d. Arc-flash tested equivalent of over 70cal/cm<sup>2</sup> (independent lab test required), UL/cUL certified for new installation.
    - e. Shall provide both visual inspection and thermal imaging on fully energized electrical equipment through closed doors.
    - f. Shall be suitable for both indoor and outdoor use.

- g. Universal thermal imaging for both shortwave and longwave camera range from 0.3um – 13um.
- h. Resistance to UV sensitivity.
- i. Free from visual defects and porosity.

## 2.07 WIRING

- A. Terminate all control circuits and wiring in the switchgear on 600 volt, barriered terminal blocks with permanent marking. Use insulated long barrel (dual crimp) locking fork, crimp on connectors equivalent to Thomas & Betts "Stakon". All current transformer wiring shall terminate on shorting type terminal blocks. Identify control wiring with permanently marked PVC or vinyl wire markers on each wire with marking to correspond with terminal identification. Wire markers shall be equivalent to Thomas & Betts type WSL self-laminating.
- B. Lugs and cable connectors for power connections shall be solid copper barrel compression type, Burndy "Hydent" Thomas & Betts color keyed compression, Anderson VCL or approved equivalent. All lugs #1/0 and larger shall be equipped with two bolt tongues.
- C. Where any wired ATS accessories and auxiliary contacts are provided and are wired out of plug-in/drawout ATSs, provide polarized nylon pluggable connector between ATS and terminal block to allow removal and reinstalling of ATS without disconnecting wires at ATS or terminal block. Connector shall be Amphenol or accepted equivalent.
- D. Color code multiple connections.
- E. Provide busway risers for all switches connected with busways. Bussing shall be the same as specified above.
- F. Control fuses shall be plug-in, UL approved, indicating type, mounted on front panel of relay compartment, and labeled, FIC Corp., or accepted equivalent by Bussman (HGC) with CLF fuses or accepted equivalent.

## 2.08 ACCEPTABLE TRANSFER SWITCH MANUFACTURERS:

Transfer Switch  
 ASCO  
 Russelectric  
 Zenith  
 Generac  
 Onan  
 Cummings

## PART 3 - EXECUTION

### 3.01 FACTORY TESTING

- A. Perform complete operational tests of the automatic transfer switch, as follows:
  - 1. Demonstrate complete transition operation between sources.
  - 2. Simulate all control and relay functions.
  - 3. Simulate all communication functions.
- B. Engineer's representative and the Owner's representative may witness factory tests, and review transfer switch operation.

1. Inform Engineer four weeks prior to tests and arrange for representatives to be present at the time of tests.

### **3.02 FIELD/ON-SITE TESTING**

- A. Inform Engineer four weeks prior to test and arrange for representatives to be present at the time of tests.
- B. After installation of transfer switch(es), test as follows:
  1. Demonstrate all functions and communications.
  2. See Section 26 0820 Testing and Commissioning for complete tests and records required for transfer switches.
  3. Complete 3<sup>rd</sup> party testing per Section 26 0820. Manufacturer to assist 3<sup>rd</sup> party with testing as required.
- C. Transfer Switch manufacturer to furnish Owner's personnel operating and maintenance training at the Owner's building for one (1) day at completion of construction. Time and date selected by Owner.

### **3.03 GUARANTEE:**

- A. Furnish Owner/Engineer with written guarantee, stating that if workmanship and/or materials executed under this division is proven defective within one (1) year from date of Owner acceptance, such defects and other work damaged will be repaired and/or replaced with parts and labor installed at the site of the work.

### **3.04 CABLE FEEDERS**

- A. Cable feeders shall be neatly formed and laced. Identify cable feeders in transfer switch with laminated nameplates fastened to cable circuits with Thomas & Betts "Tyrap".
- B. Provide cable supports.

### **3.05 INSTALLATION**

- A. Secure transfer switch to floor or wall with minimum four 1/2" bolts.
- B. Provide all necessary bracing and additional anchors required to secure transfer switch for seismic zone specified above.

**END OF SECTION**

**SECTION 26 5000  
LIGHTING****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Materials used for lighting luminaires, their installation and lamping.
- B. Standards
  - 1. CBM - Certified Ballast Manufacturers
  - 2. ETL - Electrical Testing Laboratory
  - 3. IES - Illuminating Engineering Society

**1.02 SUBMITTALS**

- A. Provide Shop Drawings and Maintenance Data for all luminaires and accessories per Section 26 0121 Electrical Submittals.

**1.03 SEISMIC REQUIREMENTS**

- A. All luminaires shall be installed with supports and bracing required for the seismic zone specified in Section 26 0100.

**PART 2 - PRODUCTS****2.01 LUMINAIRES**

- A. All luminaires shall be provided with colors as selected by Engineer/Architect. Colors baked on at factory. Site painting not acceptable. Furnish color charts.
- B. Furnish luminaires as shown on drawings in Luminaire Schedule.
- C. Verify proper voltage for each luminaire and provide ballasts to match actual applied voltage as shown on drawings.
- D. All lighting fixtures shall be certified for the specific type of application (wet, dry, damp, etc.)
- E. All lighting equipment must be of current manufacture and must carry a safety certification by an approved testing laboratory (UL, CE, ETL, etc.).
- F. All lighting shall have control - manual and/or automatic - by which it can be turned off completely without significant degradation to the life or performance of the lighting equipment. When it is turned off, it shall consume no electric energy.
- G. All lamps, ballasts, and controls serving the same fixture must be fully compatible, providing full operability of all components without significant reduction in component performance or service life.
- H. All projects must comply with all applicable Federal, State, and local laws, codes, and ordinances, including all building, energy, and accessibility codes.

**2.02 LED - LIGHT EMITTING DIODES**

- A. All LED type fixtures (Exit lights, emergency egress lights, etc.) shall comply with the below requirements.

- B. Furnish all LED luminaires in compliance with UL:
  - 1. Retrofit conversion kits shall meet UL 1598C
  - 2. Field replaceable LED light engines shall meet UL 8753
  - 3. LED equipment product shall meet UL 8750
- C. All LED fixtures shall be tested per IES LM-79 and LM-80.
- D. The delivered lumen output (initial and end-of-life) shall be .07 or less per IES.
- E. All products shall have a minimum 5 year warranty.
- F. The fixture shall be manufactured with modular components for LED, driver, fusing, etc.
- G. All LED color temperature shall meet ANSI C78.377.
- H. All fixtures shall be tested per TM-21.
- I. The rated input wattages for lighting equipment shall be within plus or minus 3 watts of the numbers shown on manufacturer cut sheets for each part of the system.

#### **2.03 PENDANTS:**

- A. Ball aligned, swivel 30 degree from vertical with swivel below canopy. Painted same color as luminaire trim.

#### **2.04 LIGHTING RACEWAY**

- A. Install fluorescent strip fixtures as shown in equipment rooms, power rooms, engine rooms, and electrical rooms using lighting raceway (Kindorf or approved equal).
- B. Support raceway from structure above at 10'-0" minimum intervals. Minimum two supports required. Support within 12" of joint.
- C. AC and DC shall not be run together in lighting raceway.

#### **2.05 LAMPS**

- A. LED – Provided with fixture.
- B. Use proper lamp for installed reflector assembly.
- C. All lamps shall be installed as new immediately prior to final inspection; do not use for construction purposes.
- D. Guarantee lamps as follows: LED lamps, five (5) years. Guarantees begin from date of Substantial Completion.

#### **2.06 EXIT LIGHTS**

- A. Exit lights shall be AC voltage rated for voltages shown. Illumination source shall be Light Emitting Diodes (LED's).

- B. Provide with AC, emergency and self-test/self-diagnostic electronics option. Emergency and self-diagnostic models equipped with isolation transformer and fully automatic constant current solid state charger with sealed maintenance-free nickel-cadmium battery. All emergency models with 2-hour minimum run time. All components mounted inside housing. Includes test switch and AC-on indicator. Transient/surge protection, low voltage disconnect, and AC lock-out features included. Battery re-charge within UL time standards. Includes pre-stripped AC input pigtail leads.
- C. Exit lights furnished with 6" high stencil letters. Use red LED's. Verify color used with local codes, if a different color is required, indicate on the shop drawing submittal.
- D. Exit lights shall be provided with universal chevrons and universal mounting.

### **PART 3 - EXECUTION**

#### **3.01 LUMINAIRE INSTALLATION**

- A. Support of luminaires shall be the responsibility of this Section.
- B. Support luminaires from structural members of building, independent of ceiling. Support grid type luminaires from ceiling. Arrange with ceiling contractor for extra ceiling support, one at each corner of luminaire. Submit hanging details to Consultant before luminaire installation.
- C. Provide devices for securing luminaire to ceiling grid to comply with Article 410-16c of National Electrical Code. ("Earthquake Clips").
- D. Anchor high intensity discharge luminaires mounted in ceiling or on wall to structure. Support recessed ceiling luminaires independent of ceiling construction. Submit hanging details to Consultant before luminaire installation.
- E. Support large HID surface luminaires with 3/8" rod run through the outlet box to structure.
- F. Support recessed luminaires with 3/4" black iron ceiling channel, one piece on each side of luminaire, anchored to ceiling system. Support large recessed luminaires over 20 pounds independent of furred ceiling system with rods, size as required, anchored to structure. Submit hanging details to Consultant before luminaire installation.
- G. Support surface and pendant luminaires independent of furred ceiling with 1/4" rods anchoring pendant to structure. Provide one support for each 4 feet of luminaire length, minimum of two supports required. Furnish complete manufacturers shop drawing for continuous luminaires showing mounting, ceiling interface and complete luminaire layout.
- H. Provide plaster frames for recessed luminaires in plaster and concealed spline ceilings supported independent of ceiling construction with 1/4" rod anchored to structure.
- I. Individual flexible connections to luminaires shall be made with 2#14 and 1#14 (ground) THHN-2 in 3/8" flexible conduit. Bond ground wire at each end.
- J. Supports shall be installed in accordance with Seismic Standards as indicated in Section 26 0100.

#### **3.02 GUARANTEE**

- A. All luminaires, components, accessories, etc., except lamps, shall be guaranteed against defects in materials and workmanship for one (1) year from date of in-service acceptance by owner. Replacement shall include parts and labor at the site of the work for the term of the warranty.
- B. Lamps shall be guaranteed as specified above.



- C. All guarantees and warranties shall include all travel expenses, fees, cost, labor and material at the site of installation for the duration of the guarantee period.

**END OF SECTION**

**SECTION 27 2100**  
**DATA COMMUNICATIONS NETWORK EQUIPMENT**

**PART 1 – GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide a Premise Distribution System including hardware, cabling, patch panels, patch cords, telecommunication outlets, work area cords and all other material as shown on drawings or specified. Installed and configured to provide data and voice connectivity from each data or voice device to a patch panel so as the circuit can be patched to the equipment as required for testing or communications. The vendor shall be responsible for all parts, labor, and all other associated apparatus necessary to completely install, test and turnover for acceptance to the customer the Structured Cabling System.

**1.02 SYSTEM DESCRIPTION**

- A. The system shall utilize a network unshielded twisted pair. Cables and terminations shall be provided and located as shown and, in the quantities, indicated on the drawings. All cables, and terminations shall be identified at all locations. All cables shall terminate in an alphanumeric sequence at all termination locations. All copper cable terminations shall comply with and be tested to TIA/EIA 568 standards for Category 6 installations. Station cables shall terminate on one, two or three gang wall plates equipped as shown on the drawings.

**1.03 STANDARDS**

- A. TIA/EIA TSB-67: Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems).
- B. TIA/EIA TSB-72: Centralized Optical Fiber Cabling Guidelines
- C. ANSI/TIA/EIA-568-B.2: Commercial Building Telecommunications Cabling Standard. Addresses the telecommunications wiring system requirements for commercial buildings that support various LAN, data, voice and image/video systems.
- D. TIA/EIA 569: Commercial Building Standard for Telecommunications Pathways and Spaces
- E. TIA/EIA 606: Administration Standard for the Telecommunication Infrastructure of Commercial Buildings
- F. TIA/EIA 607 Grounding and Bonding for Telecommunications Equipment in Commercial Buildings
- G. NEMA: National Electrical Manufacturers Association
- H. ASTM: American Society for Testing Materials
- I. NEC: National Electric
- J. IEEE: Institute of Electrical and Electronic Engineers
- K. UL: United Laboratory
- L. ANSI: American National Standards Institute Mbps.

**1.04 SUBMITTALS**

- A. Submittals shall include all items called for in this section to include manufacturers cut sheets for the following:
1. Components included in the premise cabling system.
  2. Termination components for each cable type.
  3. Test equipment to be used for fiber and copper channels.
  4. Product Data and Manufacturer's Instructions
  5. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
  6. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.
  7. A technical data sheet from the manufacturer should be included with the response for each product proposed. This data sheet shall include the physical specifications as well as the following electrical and transmission characteristics:
- B. Provide manufacturer's catalog information showing dimensions, colors, and configurations.
1. Mutual Capacitance
  2. Impedance
  3. DC Resistance
  4. Attenuation
  5. Worst Pair-to-Pair Near End Crosstalk
  6. Power Sum Near End Crosstalk
  7. Power Sum Far End Crosstalk

**1.05 FACTORY TEST**

- A. Vendor shall submit to the Engineer all factory test information prior to installation. If equivalent product(s) are substituted, the equivalent product(s) must show demonstrated and documented equivalence to the product(s) specified.

**1.06 MATERIAL GUARANTEE**

- A. The wiring vendor shall guarantee at the time of the bid that all Category 6 cabling and components meet or exceed specifications including installation of TIA/EIA-568 and 569.

**1.07 MATERIAL PROVIDED**

- A. The successful wiring vendor shall be certain that all correct parts are ordered per Products Section of this document and installed in accordance with manufacturers design and installation guidelines. Vendor shall submit complete parts and part numbers to Engineer prior to installation of equipment.

**1.08 PRODUCT WARRANTY**

- A. Documentation shall be for 20 years.
- B. Complete documentation regarding the manufacturer's warranty shall be submitted as part of the proposal. This shall include but is not limited to a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
- C. A systems application assurance manual documenting the vendor supported applications and application guidelines shall be provided as part of the submittals.
- D. Extended Product Warranty
- E. The Extended Product Warranty covers product defects for all components. Components are defined as those exhibiting no gain or contributing no energy.
- F. That the products will be free from manufacturing defects in material or workmanship under normal and proper use.
- G. That all approved cabling products that comprise the PDS exceed the specification of
- H. TIA 568 and exceed ISO/IEC 11801 standards and will conform to the performance specifications of the associated product data sheet in effect at the time the Registration Certificate is issued.
- I. That the installation will exceed the insertion and return loss, attenuation far end crosstalk (FEXT), near end crosstalk (NEXT) requirements of TIA 568 and the ISO/IEC 11801 standards for cabling links/channel configurations specified in these standards.
- J. This extended Product Warranty is applicable to the PDS only on the original site of installation. Under the Extended Product Warranty, the vendor will either repair or replace the defective product itself or will pay a reseller for the cost of labor to repair or replace any such defective product.

**1.09 APPLICATION ASSURANCE**

- A. Application Assurance covers failure of the PDS to operate the applications, which the system was designed to support, as well as additional application(s) defined below. The vendor warrants that the registered PDS will be free from failures, which prevent operation of the specific application(s).

**1.10 QUALIFICATIONS**

- A. Manufacturer Qualifications - A single manufacturer shall supply the products specified in this Request for Proposal. Manufacturer shall have a minimum of seven (7) years experience and shall be ISO 9001 Certified.
- B. Contractor Qualifications - The contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein, and has a minimum of five (5) years experience on similar PDS.
- C. Contractor Experience and Training - The contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of metallic premise distribution systems and have personnel who are adequately trained in the used of such tools and equipment.

- D. Contractor Resume - A resume of qualification shall be submitted with the Contractor's proposal indicating the following:
- E. A list of recently completed projects of similar type and size with contact names and telephone numbers for each.
- F. A list of test equipment proposed for use in verifying the installed integrity of metallic cable systems on this project.
- G. Provide a technical resume of experience for the contractor's Project Manager and on-site installation supervisor who will be assigned to this project.
- H. A list of technical product training attended by the contractor's personnel that will install the PDS shall be submitted with the response.
- I. Any sub-contractor who will assist the PDS contractor in performance of this work, shall have the same training and certification as the PDS contractor.

#### **1.11 BASIC REQUIREMENTS**

- A. Cabling
- B. Extension of all data and voice cables shall be within raceway, conduit, cable tray or other designated cable delivery system provided and installed by the contractor where concealed in walls and exposed above ceilings in plenum spaces.
- C. All communications cabling used throughout this project shall comply with the requirements as outlined in the National Electric Code (NEC®) Articles and the appropriate local codes. All copper cabling shall bear CMP (Plenum Rated), CM/CMR (Riser Rated) and/or appropriate markings for the environment in which they are installed.
- D. Hardware
- E. Required hardware includes, but is not limited to, termination blocks, fastening devices, data outlets, voice outlets, connectors and all required accessories to comply with this specification and drawings.
- F. Grounding and Bonding
- G. Communication bonding and grounding shall be in accordance with the NEC® and NFPA. Horizontal cables shall be grounded in compliance with ASNI/NFPA 70 and local requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and test apparatus and equipment. When required by local code, provide a Telecommunications Bonding Backbone utilizing a #6-AWG or larger bonding conductor that provides direct bonding between equipment rooms and telecommunications closets. This is part of the grounding and bonding infrastructure (part of the telecommunications pathways and spaces in the building structure) and is independent of equipment or cable.
- H. Fire Stopping
- I. Sealing of openings between floors, through rated fire and smoke walls, existing or created by the contractor for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the contractor's work. Any openings created by or for the contractor and left unused shall also be sealed as part of this work.
- J. Contractor Responsibility

- K. The contractor shall be responsible for damage to any surfaces or work disrupted as a result of his work. Repair of surfaces, including painting, shall be included as necessary.

## **PART 2 – PRODUCTS**

- A. Data Cable: General Cable CAT-6 GS6000 Part # 71316XX
- B. Panduit: CAT 6 Jacks-CJ688TG
- C. Face Plates-CFP4S 4 port stainless steel faceplate
  - a. CFPE4 4 port executive series faceplate (per plans)
- D. Patch Panel-DP48688TP 48 port Cat 6 patch panel (6 total)
- E. Patch Cord-UTPSP3 Cat 6 patch cord 3' (144 count)  
UTPSP10 Cat 6 patch cord 10' (144 count)
- F. Data Rack: Chatsworth 7' rack 15251-X03 (1 Total)
- G. Voice Communication Cable : CAT-3 200 pair plenum (as required)
- H. Patch Panel: Panduit dp48688tp 48 port cat 6 (6 TOTAL)
- I. Rack Mounted UPS: Eaton 5PX3000RTNG2 3000W (1 TOTAL)
- J. Rack plug strip/surge: Triplite DRS-1215 (2 total)

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All installation shall be done in conformance with EIA/TIA 568A standards and Lucent Technologies' Design and Installation guidelines. 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 any and all damages sustained to the cables by the Contractor during the implementation.
- B. Components of the PDS shall be installed in a neat, workmanlike manner. Wiring color codes shall be strictly observed, and terminations shall be uniform throughout the system. Identification markings and systems shall be uniform.
- C. J hooks shall be installed in a organized fashion above corridors then branched out to rooms. J hooks shall be installed at a maximum intervals of 48" with a maximum cable sag of 12". Installation of hooks and cabling shall be in a uniform manner to ensure a neat overall appearance.
- D. Field test all components including cables, patch panels, face plates, all connections, etc. end to end. Provide all test results and certifications.

### **3.02 FOUR (4) PAIR CATEGORY 6 CABLE**

- A. The cabling provides connections from the Patch Panel Cabinet to the information outlets (IOs) in the work areas.
- B. Contractor shall supply cables to connect each information outlet to the Patch Panel Cabinet.

- C. Unless otherwise noted on the floor plans or within this document, the type of horizontal cables used for each work location shall be 4-pair unshielded twisted pair (UTP).
- D. The 4-pair UTP cables shall be run from the Patch Panel Cabinet to every individual information outlet. All cable routes to be approved by Engineer prior to installation of the cabling.
- E. The length of each individual run of horizontal cable from the administration subsystem on each floor to the information outlet shall not exceed 295 ft (90m).
- F. Contractor shall observe the bending radius and pulling strength requirements of the 4-pair UTP cable during handling and installation.
- G. Each run of cable between the termination block and the information outlet shall be continuous without any joints or splices.
- H. In suspended ceiling and raised floor areas where walker duct, cable trays or conduit are not available, the Contractor shall bundle station wiring with plastic cable ties at appropriate distances. The cable bundling shall be supported via "J" hooks attached to the existing building structure and framework. Plenum cable will be used in all appropriate areas.
- I. If the interior of walls is not obstructed, the Contractor shall conceal horizontal distribution wiring internally within the walls. If such obstructions exist, Contractor shall secure approval by Engineer prior to the use of an alternate method.
- J. Every effort will be made to schedule the requirements under this Contract in such a manner so as to complete all above ceiling work prior to ceiling tile installation. In the event contractor is required to remove ceiling tiles, such Work shall not break or disturb grid and must be coordinated with the General Contractor.
- K. Contractor shall provide Engineer with detailed cable run diagrams for cable runs detailing exact locations of cable for review and approval by after coordination with other contractors, architect and general contractor.
- L. Conduit runs installed by the contractor should not exceed 100 feet or contain more than two 90-degree bends without utilizing appropriately sized pull boxes.
- M. Station cables and tie cables installed within ceiling spaces shall be routed through these spaces at right angles to electrical power circuits.

### **3.03 BONDING AND GROUNDING**

- A. The Contractor shall be responsible for providing an approved ground at all newly installed distribution frames, and/or insuring proper bonding to any existing facilities. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and framework. All grounds shall consist of #6 AWG copper wire and shall be supplied from an approved building ground and bonded to the main electrical ground. Grounding must be in accordance with the NEC, NFPA and all local codes and practices.

### **3.04 POWER SEPARATION**

- A. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.

### **3.05 MISCELLANEOUS EQUIPMENT**

- A. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, wire molding (MC & TC locations), miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the System.

**3.06 SPECIAL EQUIPMENT AND TOOLS**

- A. 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 wenchers.

**3.07 LABELING**

- A. The Contractor shall be responsible for printed labels for all cables and cords, Patch Panel Cabinet and outlet locations, according to Engineer's specifications. No labels are to be written by hand.

**3.08 RACEWAY INSTALLATION**

- A. Provide raceway of required size and type where indicated on job drawings; provide accessories required for a complete installation.

**3.09 TESTING/WARRANTY**

- A. Copper Cable Testing
- B. Testing of all copper wiring shall be performed prior to system cutover. 100 percent of wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Voice and data horizontal wiring pairs shall be tested from the information outlet to the Patch Panel Cabinet. The Category 6 cable runs shall be tested for conformance to the specifications of EIA/TIA 568. Testing shall be done with a TIA/EIA TSB-67 UL Certified Level 2 test set. Test shall include length, mutual capacitance, characteristic impedance, attenuation, and near-end and far end crosstalk. The contractor shall bring any pairs not meeting the requirements of the standard into compliance. Complete neatly bound and organized end-to-end test results must be submitted to Engineer for review and approval. Identify components tested to match destinations on drawings.
- C. The test results are to be summarized in a report as following:
  - 1. Description of test performed.
  - 2. Identification of each circuit tested which includes cabling and connecting hardware.
  - 3. Results to be documented for each circuit as passed or failed. Circuits that failed to be summarized and the corrective action that was taken noted.

**END OF SECTION**



**SECTION 28 4621.11  
ADDRESSABLE FIRE ALARM SYSTEM**

**PART 1 - GENERAL**

**1.01 GENERAL REQUIREMENTS**

- A. This specification defines the hardware, software and performance guidelines for a computer-based Fire Detection, Alarm and Control System (FACS).
- B. FACS as herein specified shall be fully integrated as a complete package as installed by the Contractor. The system shall include all software and hardware, wiring devices, installation supervision and labor, calibration adjustment and checkout as necessary for a complete and operational system, as intended by the drawings and the following specifications.
- C. The equipment supplier shall be an authorized factory service representative for equipment supplied. Supplier shall maintain an office and service facility with factory trained personnel within fifty miles of the site and provide service within twenty-four hours.
- D. The equipment supplier's factory trained personnel shall directly supervise the installation, connections, and tests. Supervision shall include on-the-job instructions for the installation and periodic testing. Final connection of control panels, remote annunciator, etc., shall be made by a NICET II certified factory technician.
- E. Before acceptance, manufacturer's representative will test and certify in writing that the system is installed and functioning properly as intended by the contract documents. Test includes operation of all devices in the system. Provide log of test results.
- F. Provide a handheld field programming unit if required to program monitoring and detection devices.
- G. Commissioning of fire detection and alarm systems shall be conducted in accordance with this Practice, the National Fire Protection Association ® Codes and Standards, the NFPA ® publication Commissioning Fire Protection Systems (2005 edition or later) appropriate chapters based upon the system and the locally adopted fire code acceptance testing criteria. The contractor and registered design professional shall, in cooperation with the Authority Having Jurisdiction (AHJ), identify the commissioning process for new installations and the re-acceptance testing of expanded / modified systems. It is the intent of this commissioning to comply with the minimum requirements of the herein referenced documents. Specific devices, appliances, systems, and circuits shall be tested in accordance with manufacturer's Design, Installation and Operation Manuals (DIOM). The completed system shall be commissioned by qualified personnel in the presence of an Owner duly authorized representative, local AHJ, to determine that the system has been properly installed and will function as specified.
- H. Before acceptance, manufacturer's representative will test and certify in writing that the system (by floor and total system) is installed and functioning properly as intended by the contract documents. Test includes operation of all devices in the system. Provide log of test results.
- I. Provide a list of all devices with address and description for Owner/Engineer to review and mark up. Prior to system testing. Update as required.

**1.02 DESCRIPTION OF WORK**

- A. Scope: This work includes providing a new and complete addressable fire alarm system as described herein and on the contract drawings. The system shall include all wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described.
- B. Extent of the Work: The system shall be installed in accordance with the drawings, specifications and referenced publications.
- C. Repair Service/Replacement Parts: On-site service during the guarantee period shall be provided within 24 hours after notification. All repairs shall be completed within 48 hours after notification. Repair services and replacement parts for the system shall be furnished under this contract and be available for a period of 10 years after the date of final acceptance of this work by the Owner. After the initial guarantee period replacement parts shall be provided within 48 hours of the request.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: All components of each system shall be furnished by a single manufacturer, shall be of current design and shall be in regular and recurrent production.
- B. Provide and install materials and devices for a protected premises fire alarm system, complete, conforming to National Fire Protection Association Standard 72 except as otherwise or additionally specified herein.
- C. Approved Equipment: Provide materials, equipment and devices that have been tested by a nationally recognized testing laboratory, such as Underwriters' Laboratories or Factory Mutual Laboratories, and listed or approved for fire protection service when so required by NFPA 72 or this specification.
- D. Installer Requirements: Installer shall have an office, which has been in existence for at least 3 years, within a 25-mile radius of the site. Installation shall be accomplished by an electrical contractor with a minimum of five years' experience in the installation of fire alarm systems and a NICET Level III Fire Alarm Technician on staff. The Owner may reject any proposed installer who cannot show evidence of such qualifications. The services of a technician provided by the control equipment manufacturer shall be provided to supervise installation, adjustments, and tests of the system.
- E. Service Organization: The contractor shall furnish evidence that the fire alarm equipment supplier has an experienced and effective service organization and be located within a 25-mile radius of the site, which carries a stock of repair parts for the system to be furnished. Should the contractor fail to comply with the service requirements of this section, the Owner will then have the option to make the necessary repairs and back charge the contractor without any loss of warranty or guarantee as provided by the contract documents.
- F. Guarantee: The contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the Owner and the receipt of as-built drawings and schematics of all equipment.
- G. Applicable Publications: Provide a system conforming to the requirements of the latest edition of the following publications including all amendments to these publications:

- H. American Society for Testing and Materials (ASTM):
1. E-84 Standard Test Method for Surface Burning Characteristics of Building Materials
  2. E-119 Standard Test Methods for Fire Tests of Building Construction and Materials
  3. American Society of Mechanical Engineers (ANSI/ASME):
  4. A17.1 Safety Code for Elevators and Escalators
  5. C62.41 Guide for Surge Voltages in Low Voltage A.C. Power Circuits
  6. Building Officials & Code Administrators International Inc. (BOCA):
  7. National Building Code
  8. National Fire Protection Association (NFPA):
  9. 70 National Electric Code (NEC)
  10. 72 National Fire Alarm Code
  11. 101 Life Safety Code
  12. 90A Standard for the Installation of Air Conditioning and Ventilating Systems
  13. Americans With Disabilities Act
  14. International Building Code 2006
  15. NFPA 75
- I. Testing Services or Laboratories: Construct all fire alarm and fire detection equipment in accordance with the latest edition of the following publications from Underwriters Laboratories Inc. (UL), or Factory Mutual Engineering Corporation (FM):
1. UL 1480 - Audible Signal Appliances, Fifth Edition
  2. UL 864 - Control Units for Fire Protective Signaling Systems, Ninth Edition
  3. UL 1638 - Visual Signaling Appliances Standard
  4. UL 1971 – Safety Signaling Devices for the Hearing Impaired
  5. UL Fire Protection Equipment Directory
  6. UL Electrical Construction Materials Directory

#### 1.04 DEFINITIONS

- A. General: Wherever mentioned in this specification or on the drawings the equipment, devices, and functions shall be defined as follows:
- B. Alarm Signal: A signal that indicates a state of emergency requiring immediate notification of the fire department and of the building occupants. These are signals such as the operation of a manual pull station, the activation of a water flow switch in a sprinkler system, the receipt of an alarm signal from a smoke detector that has gone through alarm verification, the receipt of an alarm signal from an elevator smoke detection control panel or a computer room smoke detection panel, the operation of a duct smoke detector or the operation of a heat detector.
- C. Supervisory Signal: A signal that indicates the impairment of a fire protection system, which may prevent its normal use.
- D. Trouble Signal: A signal which indicates that a fault, such as an open circuit or ground, has occurred in the fire alarm system or in a separate sub-system, whose control panel is monitored by the fire alarm system.
- E. Interface Device: An addressable device that interconnects hard-wired systems or devices to the Fire Alarm System.
- F. Fire Alarm Control Panel FACP: A master control panel having the features of a fire alarm control unit and to which all fire alarm control units are interconnected. The panel has

- central processing, memory, input and output terminals AND video display units (VDUs). Located at the Fire Command Center.
- G. FPS: Notification appliance circuit expander with built-in auxiliary power supply.
  - H. Class A Wiring: (Network) that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs and will allow all functions of the affected circuit to remain operational. In accordance with NFPA 72, this would be Style 7 wiring for signaling line circuits.
  - I. Class B Wiring: A circuit that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs, but which would prohibit devices beyond the fault, short or carrier loss from remaining operational. In accordance with NFPA 72, this would be Style 4 wiring for signaling line circuits, Style B for initiating device circuits, and Style Y for notification appliance circuits.
  - J. Manual Pull Station: A fire alarm box as indicated in NFPA 72.
  - K. Tamper Switch: A valve monitor switch as indicated in NFPA 72.
  - L. Initiating Device: A system component that originates transmission of a change of state condition, which initiates an appropriate response via the fire alarm system.

#### **1.05 SYSTEM OPERATION**

- A. General: System shall be a complete, supervised, non-coded, addressable fire alarm system conforming to NFPA 72. Any single impairment of the system initiating or indicating circuits shall not affect the system on more than 50 percent of any floor. The system shall operate in the alarm mode upon actuation of any alarm-initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The maximum time for the panel to reset after the reset switch is operated is 90 seconds. The system shall provide the following functions and operating features:
  - B. The FACP and PAD units shall provide power, annunciation, supervision, and control for the system.
  - C. Provide supervision for the high and low level audio riser and the tone generator to amplifiers.
  - D. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
  - E. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault, which prevents the required operation of the system. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature, which will silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.

- F. Provide a notification appliance silencing switch which, when activated, will cause the notification appliances to cease operating, but not affect the liquid crystal display or the automatic notification of the fire department or central station service, the activation of the silencing switch shall not cause the strobe lights to cease operation. This switch shall be overridden upon activation of a subsequent alarm.
- G. Provide alarm verification capability for all smoke detectors.
- H. All alarm, supervisory, or trouble signals shall be automatically transmitted to the UL listed central station.
- I. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- J. The system shall be capable of being programmed in the field. All programmed information shall be stored in non-volatile memory.
- K. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- L. There shall be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.
- M. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an HVAC system, smoke control system, elevator system, and the addressable fire alarm relay shall be within 3 feet of the emergency control device.
- N. An alarm signal shall automatically initiate the following functions:
  - 1. Visual indication of the device operated on the fire alarm control panel (FACP).
  - 2. Continuous actuation of alarm notification appliances on the floor of fire alarm origin.
  - 3. Operation of a duct smoke detector shall shut down the appropriate air handler in accordance with NFPA 90A.
  - 4. Operation of an interface, which operates vibrating pagers worn by hearing-impaired occupants.
- O. A supervisory signal shall automatically initiate the following functions:
  - 1. Transmission of a supervisory signal to a U.L. listed Central Station.
  - 2. Visual indication of the device operated on the fire alarm control panel (FACP).
  - 3. A trouble condition shall automatically initiate the following functions:
  - 4. Visual indication of the system trouble on the FACP.
  - 5. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be ten seconds.
  - 6. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed 200 seconds.
  - 7. Program a single disable point or action to disable all audio and visual devices. This action must cause a system trouble.
- P. All system supervisory alarms shall present an audible and visual indication at the building's fire alarm control panel and shall transmit a supervisory signal to the Monitoring Center. Disposition of fire alarm system supervisory signals shall conform to the requirements of NFPA 72®. National Fire Alarm Code®. Upon receipt of a supervisory signal, designated maintenance personnel shall be dispatched to the site.

- Q. All system trouble alarms shall present an audible and visual indication at the building's fire alarm control panel and all remote annunciators and shall transmit a trouble signal to the Monitoring Center. Disposition of fire alarm system trouble signals shall conform to the requirements of NFPA 72®. Upon receipt of a trouble signal, designated maintenance personnel shall be dispatched to the site.
- R. All pre-alarms shall represent an audible and visual indication at the building's fire alarm control panel and all remote annunciators and shall transmit a pre-alarm signal to the Monitoring Center. Use of very early warning fire detection systems with an alert (pre-alarm) condition shall require an investigative response by authorized personnel. Fire department shall not be dispatched upon receipt of a pre-alarm (alert or action) signal at the Monitoring Center monitoring center. Disposition of fire alarm system pre-alarm signals from VEWFD shall conform to the requirements of NFPA 72®, National Fire Alarm Code®. The pre-alarm signal shall be distinguishable from all other fire alarm, supervisory and trouble signals.
- S. **Provide cellular dialer for remote monitoring.**

#### 1.06 SUBMITTALS

- A. Submit electronic shop drawings for review until approved then submit complete set of AutoCAD drawing submittals. Partial submittals will not be acceptable and will be returned without review. Before any work is commenced, the Engineer must approve the submittal.
- B. Manufacturer's data shall be annotated and provided for the following:
1. Fire Alarm Control Storage Batteries
  2. Battery Charger
  3. Cabinet
  4. Manual Pull Station
  5. Addressable Interface Devices
  6. Terminal Cabinets/Assemblies
  7. Addressable Relays
  8. Horn/Strobe Unit
  9. Fire Alarm Horn
  10. Visual Alarm Signal Strobe
  11. Smoke Detector
  12. All Wiring Types and Sizes
- C. Shop Drawings: As a minimum, the shop drawing submittal shall include the following:
1. Provide point-to-point wiring diagrams showing the points of connection and terminals used for all electrical field connections in the system, including all interconnections between the equipment and systems, which are supervised or controlled by the system. Diagrams shall show all connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays, terminals, end-of-line resistors, and shield terminations. Provide a complete description of the system operation.
  2. Provide a complete list of device addresses and corresponding messages.
  3. Include annotated catalog data showing manufacturer's name, model, voltage, and catalog numbers for all equipment and components.

4. Provide complete battery calculations for both the alarm and supervisory power requirements. Ampere-hour requirements for each system component shall be submitted with the calculations.
5. Provide complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Provide a color code schedule for the wiring. Provide floor plans showing the location of all devices and equipment.
6. Provide voltage drop calculations for all strobe circuits.
7. Engineer will provide AutoCAD drawings with base floor plans and devices only no circuitry (if requested) to contractor for use for shop drawing submittal only.

#### **1.07 OPERATION AND MAINTENANCE MANUALS**

- A. General: Provide operation and maintenance manuals (in electronic format) during the acceptance test of the entire system and after the preliminary testing has been completed. The manuals shall be used during the instruction period hereinafter specified. Provide six bound copies of an Operation and Maintenance Manual on site after engineer's final approval of electrical manuals. The manual shall include an index, copies of all approved shop drawings and submittal materials, and a complete parts list of all components. The manual shall also include, for each item, the manufacturer's name, serial number of the part, an ordering number, if appropriate, and a physical and electrical description of the part. Following the acceptance test, drawings and submittal materials shall be updated as necessary to reflect as-built conditions.

#### **1.08 INSTRUCTION OF OWNER'S REPRESENTATIVES**

- A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train personnel designated by the Owner, in the care, adjustment, maintenance, and operation of the fire alarm system.
- B. Qualifications: Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical operation and maintenance work.
- C. Required Instruction Time: Provide 16 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and the Owner selects times as. The instruction may be divided into two or more periods at the discretion of the Owner

#### **1.09 AS-BUILT DRAWINGS**

- A. General: Prepare and submit to the Engineer one electronic set of detailed "As Built Drawings" based on engineer's final accepted AutoCAD as-builts. The drawings shall include complete wiring diagrams showing connections between all devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of all devices and equipment. The drawings shall show the system as installed, including all deviations from both the project drawings and the approved shop drawings. Submit 2 paper full size sets of drawings and one (1) legible 1/2 scale set of laminated drawings with 2 brass eyelets in corners to on site personnel and hang laminated drawings.

These drawings shall be submitted within two weeks after the final acceptance test of the system.

## **PART 2 - PRODUCTS**

### **2.01 INTELLIGENT MONITOR MODULE**

- A. The Intelligent Monitor Module shall be used to connect a supervised conventional initiating device or zone of supervised conventional initiating devices (water flow switches, tamper switches), etc., to one of the (2) wire intelligent analog loops. The module shall mount in a 4-inch square, 2-1/8-inch-deep electrical box and shall be capable of Class "A" or "B" supervised wiring to the initiating device. In order to maintain proper supervision, there shall be no T-taps allowed on Class "A" lines. The Monitor Module shall be individually addressable and store an internal identifying code which the control panel shall use to identify the type of device. Addressable interface device must have separate LEDs to indicate device operation and shall latch LED when activated. Device to be monitored for integrity such that if inoperable condition will be indicated by a trouble signal on the FACP.

### **2.02 INTELLIGENT CONTROL MODULE**

- A. The Intelligent Control Module shall be used to connect and supervise fire alarm system AHU shutdown circuit to one of the IDC (2) wire intelligent analog loops (Class "A" or "B") via programmable dry form "C" contacts. The module shall mount in a 4-inch square, 2-1/8-inch-deep electrical box and shall be capable of Class "A" or "B" supervised wiring to the indicating or control device. The Control Module shall contain an integral LED that shall flash each time the module is polled. The Control Module shall be individually addressable and store an internal identifying code which the control panel shall use to identify the type of device. Provide label on each device with address number. Addressable interface device must have separate LEDs to indicate device operation and shall latch LED when activated. Device to be monitored for integrity such that if inoperable condition will be indicated by a trouble signal on the FACP

### **2.03 ISOLATION MODULE**

- A. The Isolation Module shall be an automatic switch, which will open when the intelligent loop voltage drops below 4 volts. The Isolator Module shall be placed between groups of sensors/intelligent modules on each loop in order to protect the intelligent loop if a short (less than 4 volts) should occur. If a short occurs between any two (2) isolators, then both isolators switch to an open circuit condition and isolate the group of sensors/modules between them. The remaining devices on the intelligent loop shall continue to operate and communicate normally. The number of devices between isolators shall be (25) or less. The Isolator shall be designed to mount in a 4-inch square, 2-1/8-inch electrical box.

### **2.04 FIRE ALARM CONTROL PANEL (FACP)**

- A. General: Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. All operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120vac-60hz-essential power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation. Visual indication of alarm, supervisory or trouble initiation on the



- fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters of which at least 32 are field changeable.
- B. Cabinet: Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of all panels as well as all field wiring. An engraved laminated phenolic resin nameplate shall identify the enclosure. Lettering on the nameplate shall say FACP and shall not be less than 1-inch high. Provide prominent rigid plastic or metal identification plates for all lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.
- C. Panel Face Display: (FACP)
1. The panel face display unit shall contain as a minimum the following:
    - a. 80-character liquid crystal display
    - b. 16 key alpha-numeric keypad
    - c. Local alarm/trouble sounder
    - d. LED annunciator for the display of the following system operating parameters:
      - 1) System normal
      - 2) System alarm
      - 3) System trouble
      - 4) Alarm silence
      - 5) Test/program mode
  2. Control keys for the following functions:
    - a. Alarm/Trouble Acknowledgment
    - b. Alarm Silence
    - c. System Reset
    - d. Drill/All Call
    - e. Lamp Test
- D. Control Modules: Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm or trouble condition. The alarm signals shall be different from the trouble signal. Connect all circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and relays, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10% of nominal voltage.
- E. Silencing Switches: Provide an alarm silence switch at the FACP, which will silence the audible signal but not affect the visual alarm indicator. Provide trouble and supervisory silencing switch, which will silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm.
- F. Manual air handler unit shutdown override shall be provided as a function of the fire alarm system. With the override engaged, the associated control module shall be overridden such that the AHU's should be able to operate with the fire alarm system still in an alarm condition. Where this function is not provided as a standard component of the control panel, a separate switch (hard toggle type in lieu of soft switch) shall be provided in a secure metal box mounted on the wall adjacent to the fire alarm control panel and labeled as "AHU SHUTDOWN OVERRIDE." A control diagram showing all devices, locations and functions of the AHU system shall be located next to the override panel. If this function is not

- permitted by local code a variance shall be requested to the AHJ. This is a separate function from smoke purge switch. Provide LED/Switches (two position) to override HVAC fan shutdown with no less than one per existing AHU and 25% spare switches. All fan units that that are shown with shutdown control modules to be assigned to a switch and program to override the shutdown when moved to the override position. When any switch is in the override position, a supervisory signal shall be present at the FACP.
- G. Non-Interfering: Power and supervise each circuit such that a signal from one device does not prevent the receipt or transmission of signals from any other device. All circuits shall be manually resettable by switch from the FACP after the initiating device or devices have been restored to normal.
  - H. Fire Alarm Message: A fire alarm shall activate the standard fire alarm evacuation signal, per NFPA, which is repeated until the control panel is reset. The system shall be capable of operating all horns at the same time. The digitalized horn sound shall consist of a non-volatile (EPROM) microprocessor-based input to the supply components. The microprocessor shall actively interrogate all circuitry, field wiring and digital coding necessary for the immediate and accurate rebroadcast of the stored sound data into the appropriate supply component input. Loss of operating power, supervisory power or any other malfunction that could render the digitalized sound module inoperative shall automatically cause the appropriate notification at the control panel.
  - I. Memory: Provide each control unit with non-volatile memory and logic for all functions. The use of long-life batteries, capacitors or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS or EPROMS. The system history shall not require a printer to view.
  - J. Field Programmability: Provide control units and control panels that are fully field programmable for control, initiating, supervisory and trouble functions of both input and output. The system program configuration shall be menu driven. All system changes shall be password protected and shall be accomplished using personal computer-based equipment.
  - K. Input/Output Modifications: The FACP shall contain features which allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad and a keyboard. Any bypass or modification to the system shall indicate a trouble condition on the FACP.
  - L. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.
  - M. Instructions: Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The Engineer and Owner shall approve the instructions before being posted.
  - N. Where a fire detection and alarm system is arranged to automatically initiate fire safety control functions, such automatic functions are to be activated only by fire alarm signals, NOT pre-fire alert signals. Fire safety control functions may include ventilation-fan shutdown; smoke management system operation; pressurization of stairwells; activation of smoke removal system; egress door controls; or fire smoke damper.

- O. All system trouble alarms shall present an audible and visual indication at the system's main control panel and all remote annunciators and shall transmit a trouble signal to the Monitoring Center.
- P. Walk Test: The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated at the FACP, but no other outputs occur.
- Q. Relay Outputs: Provide switches at the FACP which by-pass elevator recall, override HVAC shut-down, bypass door release, bypass smoke control activation, and bypass central station notification.
- R. Where shown, provide local manual air handler/CAHU shutdown bypass switch with supervisory monitor module. When activated the switch shall close around the shutdown contact allowing the air handler/CAHU to run. When in the bypass mode, a supervisory condition is generated at the fire alarm control panel via the supervisory monitor module.

## **2.05 SUPPLIES, PREAMPLIFIERS, TONE GENERATORS**

- A. General: Any supplies, tone generators, digitalized voice drives and all other hardware necessary for a complete, operational horn/alarm signaling service conforming to NFPA 72 shall be housed in a main fire alarm control panel. The system shall automatically operate all building fire alarm horns.
- B. Construction: All supplies shall utilize computer grade solid state components and shall be provided with output protection devices sufficient to protect the supply against any transient up to ten (10) times the highest rated voltage in the system.
- C. Inputs: Each system shall be equipped with separate inputs from the tone generator, digitalized sound driver.
- D. Tone Generator: The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a distinct temporal pattern in accordance with NFPA and be constantly repeated until interrupted by the alarm silence mode as specified. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.
- E. Protection Circuits: Each supply shall be constantly supervised for any condition, which could render the supply inoperable at its maximum output. The audio riser shall be supervised for ground detection and low-level circuit failure. Failure of any component or circuit shall cause automatic transfer to a designated backup supply, illumination of a visual "supply trouble" indicator on the control panel, appropriate logging of the condition on the FACP and other actions for trouble conditions as specified

## **2.06 EMERGENCY POWER SUPPLY**

- A. The fire detection and alarm system primary and secondary power supply for the fire detection and alarm system shall comply with NFPA 72® National Fire Alarm Code ®. The power shall be considered an essential load and shall be connected to a panel served by a standby generator. The Network DC power plant shall not be used to power the fire alarm system or other building and life safety systems.

- B. The power supply and emergency batteries for the ASSD systems should be combined with the power supply and emergency batteries of the building fire alarm system to the greatest extent possible. The intent of this is for the entire fire detection and alarm system to be fully integrated and to function as a single system. Emergency power may be provided by battery packs at each control panel. The battery packs must be maintained throughout the life of the systems.
- C. Batteries: Provide sealed, maintenance-free, lead-calcium batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. The battery system shall be maintained in a fully charged condition by means of a solid-state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power. Batteries shall have lead bolt-on or wing-nut-type terminals.
- D. Capacity: Provide the batteries with sufficient capacity to operate all signaling line circuits, initiating device circuits, and notification appliance circuits in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the batteries shall have sufficient capacity to operate all components of the system in alarm mode for a period of 5 minutes. Test battery back-up per NFPA requirements and submit results to engineer prior to witness test and acceptance.
- E. Battery Charger: Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 150 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged the charger shall recharge them back to 95% of full charge within 48 hours. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high-rate switch is provided. Provide a separate ammeter for recording rate of charge and a separate voltmeter to indicate the state of the battery charge or provide a system, which displays this information as an integral part of the control panel

### **PART 3 - EXECUTION**

#### **3.01 ELECTRIC POWER**

- A. General: Make the service connection for the FACP at the emergency distribution panel where shown. Provide a separate NEMA 1 "General Purpose Enclosure" with toggle switch at each FACP or NAC. The disconnect enclosure shall be painted red, marked "FACP", and provided with a lockable handle or cover.

#### **3.02 SYSTEM FIELD WIRING**

- A. Wiring within Cabinets, Enclosures, Boxes, Junction Boxes and Fittings: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet. All conductors, which are terminated, spliced, or otherwise interrupted in any enclosure; cabinet; mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.
- B. Terminal Cabinets: Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Terminal size shall be appropriate for the size of the wiring to be connected. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet.

- C. Wiring: Refer to legend on drawings as a guide. Final wiring sizes shall be adequate for the loads as specified herein and required by NFPA 72 and NEC. Submit all loading calculations. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10% of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be No. 12 AWG solid copper having similar insulation. Install all conductors in  $\frac{3}{4}$ " minimum rigid metal conduit or electrical-metallic tubing. The use of flexible conduit not exceeding a six-foot length shall be permitted in initiating device circuits. Run conduit or tubing concealed unless specifically shown otherwise on the drawings. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. The drain or shield wires shall be treated as a fire alarm conductor and shall be landed on terminal strips. The drain wire shall be taped or insulated to within 1" of its termination. T-taps are permitted in Style 4 circuits with interconnections occurring on terminal strips.
- D. Conductor Terminations: No specific color coding is required for any circuit; however, labeling of any circuit at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP and remote fire alarm control unit shall contain a laminated drawing which indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12-point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals.
- E. All wiring shall comply with requirements of NFPA 70® National Electric Code® and NFPA 72® National Fire Alarm Code®.

### **3.03 FIRESTOPPING**

- A. General: Fire stop all holes for conduit, piping, or other penetrations which pass through floor slabs, fire-rated walls, partitions with fire-rated doors, vertical service shafts, or any fire-rated assemblies in accordance with Fire stopping Specification.

### **3.04 INSTALLATION OF FIRE ALARM INITIATING AND INDICATING DEVICES**

- A. FACP: Locate the FACP where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 72 inches above the finished floor or centers the cabinet at 160 inches, whichever is lower. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the FACP.

### **3.05 INSPECTION, TESTING, OR MAINTENANCE**

- A. Inspection, testing or maintenance shall be conducted by internal qualified personnel, or external organizations under a written contract. Personnel performing inspection, testing or maintenance shall be qualified and experienced in the inspection, testing and maintenance of fire alarm and detection systems. Examples of qualified personnel shall include, but shall not be limited to, individuals with the following qualifications:
1. Personnel who are factory trained and certified for fire alarm service of the specific type and brand of system.

2. Personnel who are certified by a nationally recognized fire alarm certification organization acceptable to the AHU.
  3. Personnel who are registered licensed or certified by state or local authority.
  4. Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of fire alarm systems.
- B. Inspection, testing, and maintenance of detection and alarm processing systems shall be in accordance with NFPA 72®, which has comprehensive tables that show the criteria for initiation/reacceptance, and the frequency of inspecting, testing, and maintaining all elements of detection and alarm systems. All contractual obligations for outside contractors shall require compliance with NFPA 72®.
- C. System Tests: Upon completion of the installation, the system shall be pre-tested (prior to engineer witness test) and tested for correct operation and function as described in this Practice. The tests shall be witnessed by representatives from Owner, and Architect and/or Engineer Consultant.

NOTE: Each and every device, appliance and each OPERATIONAL MODE MUST be functionally tested. This includes, but is not limited to, all smoke detectors, heat detectors, flame detectors and associated devices or appliances. This testing shall encompass all interactions, interlocks, and automatic features that are a part of the fire alarm system.

- D. Certification: The contractor shall furnish a completed "Fire Alarm System Record of Completion" upon completion of the acceptance testing per NFPA-72®.
- E. Megger Tests: After all wiring has been installed, and prior to making any connections to panels or devices, all wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors with 300 volt rated insulation shall be tested at a minimum of 250 VDC. Conductors with 600 volt rated insulation shall be tested at a minimum of 500 VDC.
- F. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Engineer and test results recorded for use at the final acceptance test.
- G. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.
- H. Final Testing: Notify the Engineer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. A final acceptance test will not be scheduled until the following are provided at the job site:
1. Certification letter for pre-testing completion
  2. Marked-up red line drawings of the system as actually installed
  3. Audibility test results
  4. Megger test results
  5. Battery test results
  6. Loop resistance test results

7. AHJ testing schedule
  8. Complete program printout including all input/output addresses
- I. The Engineer and Owner shall witness the final tests. At this time, any and all required tests shall be repeated at the discretion of the Engineer. Following acceptance of the system, as-built drawings and Operation and Maintenance (O&M) Manuals shall be delivered to the Owner for review and acceptance. In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M Manuals are received.

### **3.06 MINIMUM SYSTEM TESTS**

- A. General: Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:
  - B. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
  - C. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
  - D. Test each initiating and indicating device and circuit for proper operation and response at the control unit.
  - E. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
  - F. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.
  - G. Determine that the system is operable under trouble conditions as specified.
  - H. Visually inspect all wiring.
  - I. Test the battery charger and batteries.
  - J. Verify that all software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Engineer.
  - K. Verify that redline drawings are accurate.
  - L. Measure the current in circuits to assure there is the calculated spare capacity for the circuits.
  - M. Measure voltage readings for circuits to assure that voltage drop is not excessive.
  - N. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
  - O. Measure the voltage drop at the most remote appliance on each notification appliance circuit.

**3.10 FLOOR PLANS WITH DEVICE ADDRESSES**

- A. Furnish diagrams of each protected floor (approximately 1/8" scale) showing floor plan. One drawing per floor; do not split large floors into two or more diagrams. Floor plans shall include all stairs, exits, and necessary room names to orient the personnel. Indicate location of main control panel, annunciator panels, all devices, and system wiring. Show address number by each initiating device. Provide a legend (description) of all devices shown on diagram. Submit diagram to Engineer for review before installation. Laminate approved diagrams with eyelets and wall mounted hooks. Mount frame to wall adjacent to FACP. Provide all diagrams at the main control panel and appropriate floor zone diagram at each annunciator panel. Contractor has option to request Owner to provide and mount diagrams at the contractor's expense. Remove existing diagrams. Contractor shall provide temporary zone diagrams as soon as new system is placed in service.

**3.11 TRAINING**

- A. The contractor shall provide training for the Owner. The training shall include normal maintenance of installed systems, trouble-shooting procedures, and emergency procedures. The contractor shall provide the services of the manufacturer's trained representative commensurate with the size and complexity of the system, during normal business hours, to instruct the Owner's designated personnel on the operation of the system. With the approval of the Owner, this training may be performed during final system acceptance and/or certification. As required by the project manager, training documents, CD's, videos, or other media may be provided for future training and continuing education.

**END OF SECTION**



**SECTION 311000  
SITE CLEARING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Protecting existing vegetation to remain.
  2. Removing existing vegetation.
  3. Clearing and grubbing.
  4. Stripping and stockpiling topsoil.
  5. Removing above- and below-grade site improvements.
  6. Disconnecting, capping, or sealing site utilities.
  7. Temporary erosion and sedimentation control.

**1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Pell City Fire Station #2.

**1.3 MATERIAL OWNERSHIP**

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

**1.4 FIELD CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises **where indicated**.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

**3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

**3.3 EXISTING UTILITIES**

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

**3.4 CLEARING AND GRUBBING**

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

**3.5 TOPSOIL STRIPPING**

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of **3 inches** in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

**3.6 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

**3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

**END OF SECTION 311000**

## SECTION 312000 EARTH MOVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Excavating and filling for rough grading the Site.
  2. Preparing subgrades for **slabs-on-grade, walks, pavements, and turf and grasses.**
  3. Excavating and backfilling for buildings and structures.
  4. Drainage course for concrete slabs-on-grade.
  5. Subbase course for concrete **walks and pavements.**
  6. Subbase course **and base course** for asphalt paving.
  7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

#### 1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.

- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Pell City Fire Station #2.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

### 1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification **Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487** or **Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145** or a combination of these groups; free of rock or gravel larger than **3 inches** in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification **Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487** or **Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145**, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90

percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

## **2.2 ACCESSORIES**

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored to comply with local practice or requirements of authorities having jurisdiction.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### **3.2 EXCAVATION, GENERAL**

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### **3.3 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

### **3.4 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.5 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  1. Clearance: **12 inches** each side of pipe
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### **3.6 SUBGRADE INSPECTION**

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### **3.7 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Architect.
  1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### **3.8 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.9 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.

- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in **Section 033000 "Cast-in-Place Concrete."**
- D. Initial Backfill: Place and compact initial backfill of **satisfactory soil**, free of particles larger than **1 inch** in any dimension, to a height of 12 inches over the pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### **3.10 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.

### **3.11 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### **3.12 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than **8 inches** loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the 98 percent of maximum dry unit weight according to **ASTM D 698 in all areas**



### 3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus **1 inch** .
  - 2. Walks: Plus or minus **1 inch**
  - 3. Pavements: Plus or minus **1/2 inch**
- C. Grading inside Building Lines: Finish subgrade to a tolerance of **1/2 inch** when tested with a 10-foot straightedge.

### 3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course **and base course** on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course **and base course** under pavements and walks as follows:
  - 1. Shape subbase course **and base course** to required crown elevations and cross-slope grades.
  - 2. Place subbase course **and base course** that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 3. Compact subbase course **and base course** at optimum moisture content to required grades, lines, cross sections, and thickness to not less than **95** percent of maximum dry unit weight according to **ASTM D 698**.

### 3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than **98** percent of maximum dry unit weight according to ASTM D 698.

### 3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### **3.17 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION 312000**

**SECTION 313116  
TERMITE CONTROL**

**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Soil treatment.

**1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at **Mount Zion Baptist Church**.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include the EPA-Registered Label for termiticide products.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Product certificates.
- B. Soil Treatment Application Report: Include the following:
1. Date and time of application.
  2. Moisture content of soil before application.
  3. Termiticide brand name and manufacturer.
  4. Quantity of undiluted termiticide used.
  5. Dilutions, methods, volumes used, and rates of application.
  6. Areas of application.
  7. Water source for application.
- C. Sample Warranties: For special warranties.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

**1.6 WARRANTY**

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (*Coptotermes formosanus*). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
1. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 SOIL TREATMENT**

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Corporation, Agricultural Products; Termidor.
    - b. Bayer Environmental Science; Premise 75.
    - c. FMC Corporation, Agricultural Products Group; Dragnet FT, Talstar, or Prevail.
    - d. Syngenta; Demon TC, Prelude, or Probuild TC.
  - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.

### **3.2 APPLYING SOIL TREATMENT**

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
  - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
  - 2. slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
  - 3. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
  - 4. Crawlspace: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
  - 5. hed concrete platform and porches are on fill or ground.

6. Masonry: Treat voids.
  7. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

**END OF SECTION 313116**

**SECTION 321216  
ASPHALT PAVING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Hot-mix asphalt paving.
  - 2. Hot-mix asphalt patching.
  - 3. Hot-mix asphalt paving overlay.
  - 4. Pavement-marking paint.
  - 5. Cold milling of existing hot-mix asphalt pavement.
- B. Related Sections include the following:
  - 1. Division 2 Section "Earthwork" for aggregate sub-base and base courses and for aggregate pavement shoulders.

**1.3 DEFINITIONS**

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.

**1.4 SYSTEM DESCRIPTION**

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
  - 1. Standard Specification: Local Standard Specifications / DOT.
  - 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

**1.5 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

**1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A qualified manufacturer.
  - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.
- B. Regulatory Requirements: Comply with Standards of local regulatory authority for asphalt paving work.

- C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

### **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
  - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
  - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

## **PART 2 - PRODUCTS**

### **2.1 AGGREGATES**

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

### **2.2 ASPHALT MATERIALS**

- A. Asphalt Binder: AASHTO MP 1.
- B. Asphalt Cement: ASTM D 946 for penetration-graded material.
- C. Prime Coat: ASTM D 2027, medium-curing cutback asphalt.
- D. Prime Coat: Asphalt emulsion prime complying with local regulatory requirements.
- E. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Water: Potable.

- G. Undersealing Asphalt: ASTM D 3141, pumping consistency.

### **2.3 AUXILIARY MATERIALS**

- A. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- B. Joint Sealant: ASTM D 3405, hot-applied, single-component, polymer-modified bituminous sealant.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
- D. Glass Beads: AASHTO M 247, Type 1.

### **2.4 MIXES**

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:
    - a. Base Course: 1 inch.
    - b. Surface Course: 1/2 inch.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll sub-base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### **3.2 PATCHING**

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
  - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.



- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

### **3.3 SURFACE PREPARATION**

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### **3.4 HOT-MIX ASPHALT PLACING**

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F.
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
  - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.5 JOINTS**

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
  2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
  5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  6. Compact asphalt at joints to a density within 2 percent of specified course density.

### **3.6 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
  2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.7 INSTALLATION TOLERANCES**

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch.
  - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch.
  - 2. Surface Course: 1/8 inch.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### **3.8 SURFACE TREATMENTS**

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With a fine sand, lightly dust areas receiving excess fog seal.

### **3.9 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal..

### **3.10 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- C. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### **3.11 DISPOSAL**

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow excavated materials to accumulate on-site.

**END OF SECTION 321216**

**SECTION 321313  
CONCRETE PAVING****PART 1 - GENERAL****1.1 SUMMARY**

A. Section Includes Concrete Paving.

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

**1.2 ACTION SUBMITTALS**

A. Product Data: For each type of product.

B. LEED Submittals:

1. Laboratory Test Reports for Credit SS 7.1: For concrete paving mixtures, documentation indicating that cured concrete complies with requirement for Solar Reflectance Index.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.

C. Samples: For each type of product, ingredient, or admixture requiring color selection.

D. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

**1.3 QUALITY ASSURANCE**

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

**1.4 PRECONSTRUCTION TESTING**

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

## **PART 2 - PRODUCTS**

### **2.1 CONCRETE, GENERAL**

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

### **2.2 STEEL REINFORCEMENT**

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **25** percent.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars. Cut bars true to length with ends square and free of burrs.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

### **2.3 CONCRETE MATERIALS**

- A. Regional Materials: Concrete shall be manufactured within 500 miles (800 km) of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, uniformly graded. Provide aggregates from a single source.
- C. Water: Potable and complying with ASTM C 94/C 94M.
  - 1.

### **2.4 RELATED MATERIALS**

- A. Joint Fillers: **ASTM D 1752, cork or self-expanding cork** in preformed strips.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
- C. Glass Beads: AASHTO M 247, Type 1.
- D. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

### **2.5 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
- B. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): **4500 psi for driveways** and **2500 psi for sidewalks**.
2. Maximum W/C Ratio at Point of Placement: **0.50**.
3. Slump Limit: **4 inches**
4. Solar Reflectance Index: Not less than 29.

## 2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Proof-roll prepared subbase surface below **concrete paving** to identify soft pockets and areas of excess yielding.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, **to match jointing of existing adjacent concrete paving**.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a **1/4-inch (6-mm)** radius. Repeat tooling of edges after applying surface finishes. **Eliminate edging-tool marks on concrete surfaces.**

### 3.6 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- B. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
  - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.
  - 1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
  - 2. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written



instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by **moisture curing, moisture-retaining-cover curing, curing compound or a combination of these.**

### **3.9 PAVING TOLERANCES**

- A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:
  - 1. Elevation: 3/4 inch (19 mm).
  - 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
  - 3. Surface: Gap below 10-foot- (3-m-) long; unlevelled straightedge not to exceed 1/2 inch (13 mm).
  - 4. Joint Spacing: 3 inches (75 mm).
  - 5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
  - 6. Joint Width: Plus 1/8 inch (3 mm), no minus.

### **3.10 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal.

### **3.11 REPAIR AND PROTECTION**

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION 321313**

**SECTION 330500  
COMMON WORK RESULTS FOR UTILITIES**

**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Piping joining materials.
  - 2. Dielectric fittings.
  - 3. Sleeves.
  - 4. Identification devices.
  - 5. Grout.
  - 6. Piping system common requirements.
  - 7. Equipment installation common requirements.
  - 8. Concrete bases.
  - 9. Metal supports and anchorages.

**1.2 DEFINITIONS**

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Dielectric fittings.
  - 2. Identification devices.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

**1.5 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

## **PART 2 - PRODUCTS**

### **2.1 PIPING JOINING MATERIALS**

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
  - 1. ABS Piping: ASTM D 2235.
  - 2. CPVC Piping: ASTM F 493.
  - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 4. PVC to ABS Piping Transition: ASTM D 3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

### **2.2 DIELECTRIC FITTINGS**

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
  - 1. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.
    - a. Pressure Rating: **250 psig (1725 kPa)** at 180 deg F (82 deg C).
    - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
  - 1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.

- a. Pressure Rating: **175 psig (1200 kPa) minimum.**
  - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric Couplings:
- 1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.
    - a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
    - b. End Connections: Threaded.
- E. Dielectric Nipples:
- 1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
    - a. Pressure Rating: **300 psig (2070 kPa) at 225 deg F (107 deg C)**
    - b. End Connections: Threaded or grooved.

### 2.3 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

### 2.4 IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
  - 2. Location: Accessible and visible.
- B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.
- D. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers, extending 360 degrees around pipe at each location.

- E. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.
- F. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
  - 1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.
- G. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.
  - 1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
  - 2. Color: Comply with ASME A13.1, unless otherwise indicated.
- H. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole for fastener.
  - 1. Material: 0.032-inch- (0.8-mm-) thick, **polished brass or aluminum**.
  - 2. Material: 0.0375-inch- (1-mm-) thick stainless steel.
  - 3. Material: 3/32-inch- (2.4-mm-) thick plastic laminate with 2 black surfaces and a white inner layer.
  - 4. Material: Valve manufacturer's standard solid plastic.
  - 5. Size: 1-1/2 inches (40 mm) in diameter, unless otherwise indicated.
  - 6. Shape: As indicated for each piping system.
- I. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.
- J. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
  - 1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
  - 2.
  - 3. Thickness: 1/16 inch (1.6 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3 mm) for larger units.
  - 4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.
- K. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
  - 1. Green: Cooling equipment and components.
  - 2. Yellow: Heating equipment and components.
  - 3. Brown: Energy reclamation equipment and components.

4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:
  - a. Name and plan number.
  - b. Equipment service.
  - c. Design capacity.
  - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
7. Size: 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

## 2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.1 DIELECTRIC FITTING APPLICATIONS**

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
  1. NPS 2 (DN 50) and Smaller: Dielectric unions.
  2. NPS 2-1/2 (DN 65) and Larger: Dielectric flanges.
- B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
  1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
  2. NPS 2-1/2 (DN 65) and Larger: Dielectric nipples.

### **3.2 PIPING INSTALLATION**

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.

- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas **2 inches (50 mm)** above finished floor level.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
    - a. **[PVC] [Steel]** Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

### **3.3 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube

Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
  - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### **3.4 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Install dielectric fittings at connections of dissimilar metal pipes.

### **3.5 EQUIPMENT INSTALLATION**

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.



- C. Install equipment to allow right of way to piping systems installed at required slope.

### 3.6 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  - 1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
  - 2. Locate pipe markers on exposed piping according to the following:
    - a. Near each valve and control device.
    - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    - d. At manholes and similar access points that permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
  - 1. Lettering Size: Minimum 1/4 inch (6.4 mm) high for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (13 mm) high for distances up to 72 inches (1800 mm), and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
  - 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

### 3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in **Section 033000 "Cast-in-Place Concrete."**

### **3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Section 055000 "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### **3.9 GROUTING**

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION 330500**

**SECTION 02530  
SANITARY SEWERAGE**

**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - Pipe and fittings.
  - Nonpressure and pressure couplings.
  - Expansion joints.
  - Cleanouts.
  - Encasement for piping.
  - Manholes.

**1.2 SUBMITTALS**

- A. Product Data: For expansion joints.
- B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- E. Field quality-control reports.

**PART 2 - PRODUCTS****2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 74, Service class, Service and Extra-Heavy classes, or Extra-Heavy class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

**2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI-Trademark, Shielded Couplings:

Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. ANACO-Husky.
- b. Dallas Specialty & Mfg. Co.
- c. Fernco Inc.

- d. Mission Rubber Company; a division of MCP Industries, Inc.
- e. Stant; a Tompkins company.
- f. Tyler Pipe.

Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

### **2.3 PVC PIPE AND FITTINGS**

#### **A. PVC Sewer Piping:**

Pipe: ASTM D 3034, SDR 26 Heavy Wall Sewer Pipe, meeting the requirements of ASTM D3034 for 4" to 15" gravity pipe and ASTM F679 for 18" and 21" gravity pipe, with bell-and-spigot ends for gasketed joints.

Fittings: ASTM D 3034, PVC with bell ends.

Gaskets: ASTM F 477, elastomeric seals.

### **2.4 NONPRESSURE-TYPE TRANSITION COUPLINGS**

#### **A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.**

#### **B. Sleeve Materials:**

For Cast-Iron Soil Pipes: ASTM C 564, rubber.

For Concrete Pipes: ASTM C 443, rubber.

For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

#### **C. Unshielded, Flexible Couplings:**

Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

#### **D. Ring-Type, Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.**

### **2.5 EXPANSION JOINTS**

#### **A. Ductile-Iron, Flexible Expansion Joints:**

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. EBAA Iron, Inc.
- b. Romac Industries, Inc.
- c. Star Pipe Products.

Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

## 2.6 CLEANOUTS

- A. Cast-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

## 2.7 ENCASEMENT FOR PIPING

- A. Standard: ASTM A252 Grade 2.  
B. Material: Carbon Steel.

## 2.8 MANHOLES

- A. Standard Precast Concrete Manholes:

Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

Diameter: 48 inches minimum unless otherwise indicated.

Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.

Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.

Top Section: Concentric-cone; with top of cone of size that matches grade rings.

Joint Sealant: ASTM C443 rubber gasketed joints.

External Sealing Sleeve: External joint sealing sleeve to prevent infiltration and inflow as manufactured by Sealing Systems, inc. or approved equivalent.

Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

Steps: Individual ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.

Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

Inverts: Precast concrete. Brick and mortar inverts are not allowed.

- B. Manhole Frames and Covers:

Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."

Material: East Jordan Iron Works Model V-1480-1 unless otherwise indicated.

## 2.9 CONCRETE

- A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

Cement: ASTM C 150, Type II.

Fine Aggregate: ASTM C 33, sand.

Coarse Aggregate: ASTM C 33, crushed gravel.

Water: Potable.

- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

- C. Manhole Channels and Benches: Factory formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

- a. Invert Slope: As shown on drawings.

Benches: Concrete, sloped to drain into channel.

- b. Slope: 8 percent.

- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install

gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

- C. Install manholes for changes in direction. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure, drainage piping according to the following:

Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.

Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.

Install piping with 36-inch minimum cover.

Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.

Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

Hub-and-spigot, cast-iron soil pipe.

Hubless cast-iron soil pipe and fittings.

Expansion joints.

- H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

### **3.3 PIPE JOINT CONSTRUCTION**

- A. Join gravity-flow, nonpressure, drainage piping according to the following:

Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

Join PVC corrugated sewer piping according to ASTM D 2321.

Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.

Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.

Join dissimilar pipe materials with nonpressure-type, flexible couplings.

- B. Pipe couplings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

- a. Unshielded flexible couplings for pipes of same or slightly different OD.
- b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
- c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

### **3.4 MANHOLE INSTALLATION**

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

### **3.5 CONCRETE PLACEMENT**

- A. Place cast-in-place concrete according to ACI 318.

### **3.6 CLEANOUT INSTALLATION**

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.

Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.



Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### **3.7 CONNECTIONS**

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."
- B. Make connections to existing piping and underground manholes.

Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

- a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
- b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### **3.8 IDENTIFICATION**

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

Use detectable warning tape over ferrous piping.

Use detectable warning tape over nonferrous piping and over edges of underground manholes.

### **3.9 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

Submit separate report for each system inspection.

Defects requiring correction include the following:

- a. Alignment: Less than full diameter of inside of pipe is visible between structures.
- b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
- c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
- d. Infiltration: Water leakage into piping.
- e. Exfiltration: Water leakage from or around piping.

Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

Reinspect and repeat procedure until results are satisfactory.

- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

Do not enclose, cover, or put into service before inspection and approval.

Test completed piping systems according to requirements of authorities having jurisdiction.

Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

Submit separate report for each test.

Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

- a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
- b. Close openings in system and fill with water.
- c. Purge air and refill with water.
- d. Disconnect water supply.
- e. Test and inspect joints for leaks.

Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- f. Option: Test plastic gravity sewer piping according to ASTM F 1417.
- g. Option: Test concrete gravity sewer piping according to ASTM C 924.

Manholes: Perform hydraulic test according to ASTM C 969.

- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### **3.10 CLEANING**

- A. Clean dirt and superfluous material from interior of piping.

**END OF SECTION 02530**

**SECTION 334100  
STORM UTILITY DRAINAGE PIPING**

**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Pipe and fittings.
  2. Channel drainage systems.
  3. Encasement for piping.
  4. Manholes.
  5. Cleanouts.
  6. Nonpressure transition couplings.
  7. Expansion joints.
  8. Catch basins.
  9. Stormwater inlets.
  10. Pipe outlets.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
1. Manholes: Include plans, elevations, sections, details, frames, and covers.
  2. Include plans, elevations, sections, details, frames, covers, and grates.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

**1.4 PROJECT CONDITIONS**

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify **Construction Manager** no fewer than **two days** in advance of proposed interruption of service.
  2. Do not proceed with interruption of service without **Construction Manager's written** permission.

**PART 2 - PRODUCTS****2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

**2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Heavy-Duty, Shielded Couplings:
  - 1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

**2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS**

- A. Pipe: ASTM A 716, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

**2.4 PVC PIPE AND FITTINGS**

- A. PVC Corrugated Sewer Piping:
  - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
  - 3. Gaskets: ASTM F 477, elastomeric seals.

**2.5 CONCRETE PIPE AND FITTINGS**

- A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M), **Class 3**, with **bell-and-spigot or tongue-and-groove** ends and **rubber gaskets**
- B. Sleeve Materials:
  - 1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
  - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
  - 3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Shielded, Flexible Couplings:
  - 1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

## 2.6 CLEANOUTS

### A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): [**Heavy Duty**].
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

## 2.7 MANHOLES

### A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: **Individual FRP steps**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than **60 inches (1500 mm)**.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

### B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: **ASTM A 48/A 48M, Class 35 gray** iron unless otherwise indicated.

## 2.8 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:
  1. Cement: ASTM C 150, Type II.
  2. Fine Aggregate: ASTM C 33, sand.
  3. Coarse Aggregate: ASTM C 33, crushed gravel.
  4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
  1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
  1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    - a. Invert Slope: **see plans for invert locations and provide constant slope across manhole.**
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
  1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

## 2.9 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening.

## 2.10 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as

indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 3. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
  - 4. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  - 2. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

### 3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use Light-Duty, top-loading classification cleanouts in **earth or unpaved foot-traffic** areas.
  - 2. Use Medium-Duty, top-loading classification cleanouts in **paved foot-traffic** areas.
  - 3. Use Heavy-Duty, top-loading classification cleanouts in **vehicle-traffic service** all areas.



- B. Set cleanout frames and covers in earth in cast-in-place concrete block, **18 by 18 by 12 inches (450 by 450 by 300 mm)** deep. Set with tops flush with surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### **3.5 MANHOLE INSTALLATION**

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops **3 inches (76 mm)** above finished surface elsewhere unless otherwise indicated.

### **3.6 STORMWATER OUTLET INSTALLATION**

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

### **3.7 CONCRETE PLACEMENT**

- A. Place cast-in-place concrete according to ACI 318.

### **3.8 CONNECTIONS**

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
  - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall,

encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

- a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
  - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### **3.9 IDENTIFICATION**

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  1. Use warning tape over ferrous piping.
  2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### **3.10 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
  1. Submit separate reports for each system inspection.
  2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  1. Do not enclose, cover, or put into service before inspection and approval.
  2. Test completed piping systems according to requirements of authorities having jurisdiction.
  3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
  - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
  - b. Option: Test plastic piping according to ASTM F 1417.
  - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**END OF SECTION 334100**