



QUACKENBUSH ARCHITECTS + PLANNERS

# Horry Georgetown Technical College

## HGTC - Diesel Engine Training Facility

### Interior Renovation

Conway, South Carolina

Architect's Project Number 21.286.00

State Project Number H59-N134-MJ

BID SET

January 14, 2022

[Quackenbusharchitects.com](http://Quackenbusharchitects.com)

1217 Hampton Street  
Columbia SC 29201

803 771 2999 P  
803 771 2858 F

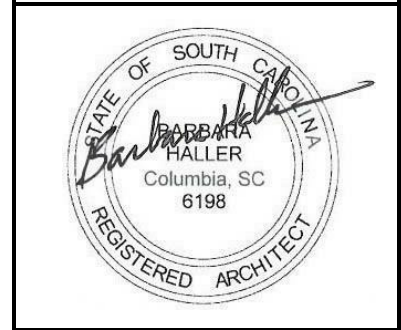
PROJECT DIRECTORY

OWNER	Horry Georgetown Technical College 2050 US-501 Conway, SC 29526 Attention: Kevin Brown
ARCHITECT OF RECORD	Quackenbush Architects + Planners 1217 Hampton Street Columbia, South Carolina 29201 p.(803) 771-2999 Attention: Ms. Barbara Haller
MECHANICAL ENGINEER	Buford Goff & Associates, Inc. 1331 Elmwood Avenue, Suite 200 Columbia, SC 29201 p.(803) 254-6302 f.(803)771-6142 Attention: Jonathan Burkett
PLUMBING ENGINEER	Buford Goff & Associates, Inc. 1331 Elmwood Avenue, Suite 200 Columbia, SC 29201 p.(803) 254-6302 f.(803)771-6142 Attention: Mahyar Angooraj
ELECTRICAL ENGINEER	Buford Goff & Associates, Inc. 1331 Elmwood Avenue, Suite 200 Columbia, SC 29201 p.(803) 254-6302 f.(803)771-6142 Attention: Brian Melson

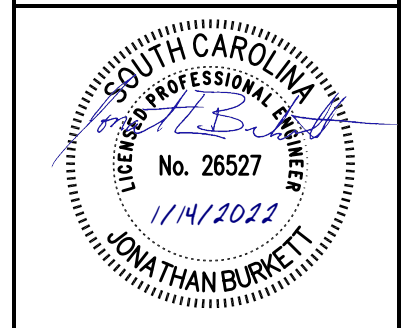
DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT            **Quackenbush Architects + Planners**  
                             **Barb Haller, AIA**  
                             Division 0-10, 32



MECHANICAL        **Buford Goff Associates**  
ENGINEER            **Jonathan Burkett, P.E.**  
                             **The following sections:**  
                             Division 26



PLUMBING  
ENGINEER

**Buford Goff Associates**  
**Mahyar Angooraj**  
**The following Sections:**  
Division 22



ELECTRICAL  
ENGINEER

**Buford Goff Associates**  
**Brian Melson**  
**The following Sections:**  
Division 26, 27, 28



## **TABLE OF CONTENTS**

**PROJECT NAME:** HGTC - Diesel Engine Training Facility Interior Renovation

**PROJECT NUMBER:** H59-N134-MJ

<b><u>SECTION</u></b>	<b><u>NUMBER OF PAGES</u></b>
Table of Contents .....	4
SE-310, Invitation for Design-Bid-Build Construction Services.....	1
AIA Document A701 Instructions to Bidders South Carolina Division of Procurement Services, Office of State Engineer Version.....	13
Bid Bond (AIA A310 or reference) .....	1
SE-330, Lump Sum Bid Form .....	6
AIA Document A101 Standard Form of Agreement between Owner and Contractor (Including Exhibit A) South Carolina Division of Procurement Services, Office of State Engineer Version.....	14
AIA Document A201 General Conditions of the Contract for Construction South Carolina Division of Procurement Services, Office of State Engineer Version.....	46
SE-355, Performance Bond .....	2
SE-357, Labor & Material Payment Bond.....	2
SE-380, Change Order to Design-Bid-Build Construction Contract .....	1

**TECHNICAL SPECIFICATIONS**

## DIVISION 00 - PROCUREMENT

001100 Summary

## DIVISION 01 - GENERAL REQUIREMENTS

012300 Alternates  
012500 Substitution Procedures  
012600 Contract Modification Procedures  
012900 Payment Procedures  
013100 Project Management and Coordination  
013200 Construction Progress Documentation  
013300 Submittal Procedures  
013516 Alteration Project Procedures  
014000 Quality Requirements  
014200 References  
015000 Temporary Facilities and Controls  
016000 Product Requirements  
017300 Execution  
017700 Closeout Procedures  
017823 Operation and Maintenance Data  
017839 Project Record Documents  
017900 Demonstration and Training

## DIVISION 02 - EXISTING CONDITIONS

024119 Selective Demolition

## DIVISION 07 - THERMAL &amp; MOISTURE PROTECTION

079200 Joint Sealants

## DIVISION 08 - OPENINGS

081113 Hollow Metal Doors and Frames  
083323 Overhead Coiling Door - ALTERNATE #1  
087100 Door Hardware  
088000 Glazing  
089119 Fixed Louvers

## DIVISION 09 - FINISHES

092216 Non-Structural Metal Framing  
092900 Gypsum Board  
093013 Ceramic Tiling  
095113 Acoustical Panel Ceilings  
096513 Resilient Base and Accessories  
096519 Resilient Tile Flooring  
097700 Fiber Reinforced Panels  
099124 Painting (MPI Standards)

## DIVISION 10 - SPECIALTIES

102113.17 Phenolic-core Toilet Compartments  
102600 Wall and Door Protection

- 102800 Toilet, Bath, and Laundry Accessories
- 104416 Fire Extinguishers
- 107300 Aluminum Walkway Canopies

#### DIVISION 22 - PLUMBING

- 220500 General Plumbing Requirements
- 220501 Common Plumbing Materials
- 220503 Demolition, Patching and Repair
- 220505 Trenching and Excavation
- 220510 Documentation and Closeout
- 220511 Submittals
- 220517 Sleeves, Seals, and Escutcheons
- 220519 Meters and Gauges For Plumbing Piping
- 220523 General-Duty Valves For Plumbing Piping – “LEAD FREE”
- 220529 Hangers and Supports For Plumbing Piping
- 220553 Identification For Plumbing Piping and Equipment
- 220592 System Start-Up
- 220601 Hydronic Specialties
- 220700 Plumbing Insulation
- 220719 Plumbing Piping Insulation
- 221100 Plumbing Piping
- 221123 Plumbing Pumping System
- 223400 Fuel Fired Domestic Water Heaters
- 224011 Plumbing Accessories
- 224013 Plumbing Fixtures (General)
- 224100 Plumbing Fixtures (Sinks and Lavatories)
- 224300 Plumbing Fixtures (Water Closets and Urinals)
- 224400 Plumbing Fixtures (Water Fountain and Water Coolers)

#### DIVISION 23 - MECHANICAL

- 230501 General HVAC Requirements
- 230502 Common HVAC Materials
- 230508 Required Coordination Meetings
- 230510 Documentation and Closeout
- 230511 Submittals
- 230513 Common Motor Requirements For HVAC Equipment
- 230514 Variable Frequency Drives
- 230515 Controllers, Starters, And Electrical Work
- 230517 Sleeves, Seals, and Escutcheons
- 230529 Hangers and Supports For HVAC Piping
- 230548 Sound, Vibration, and Seismic Control For HVAC
- 230592 System Start-Up
- 230593 Testing, Adjusting, and Balancing For HVAC
- 230700 HVAC Insulation
- 230713 Duct Insulation
- 230719 HVAC Piping Insulation
- 230900 Instrumentation and Controls For HVAC (General)
- 230900.02 Controls For HVAC (Flow Measurement)
- 230904 Building Automation System

- 230993 Sequence Of Operations For HVAC Controls and Points List
- 230993.02 Sequence Of Operation (Air Handling Equipment)
- 230993.04 Sequence Of Operation (Electric Heaters)
- 230993.06 Sequence Of Operation (Single Zone Packaged Equipment)
- 230993.08 Sequence Of Operation (100% Outside Air Equipment)
- 230993.09 Sequence Of Operation (Various Systems)
- 232113 HVAC Piping (General)
- 233112 Mechanical Duct
- 233113.01 Metal Duct
- 233113.05 Fabric Duct
- 233300 Duct Accessories
- 233313 Dampers
- 233346 Flexible Duct
- 233400 HVAC Fans
- 233713 Diffusers, Registers, and Grilles
- 233714 Air Distribution Specialties
- 234100 Particulate Air Filtration
- 237800 Central Dehumidification
- 239005 Heat Transfer (Electric Cooling)
- 239005.02 Heat Transfer (Electric Cooling, VRF Systems)
- 239006 Heat Transfer (Electric Heaters)

#### DIVISION 26 - ELECTRICAL

- 260500 Electrical General Requirements
- 260501 Electrical Coordination
- 260502 Electrical Demolition
- 260503 Cutting, Patching And Repair
- 260519 Wire And Cable - Building Wire (600 Volts And Below)
- 260526 Grounding
- 260533 Metallic Conduits/Raceways And Fittings
- 260535 Electrical Boxes
- 260548 Seismic Support Of Electrical Equipment
- 262416 Panelboards
- 262726 Wiring Devices
- 262816 Safety/Disconnect Switches
- 264313 Surge-Protective Devices
- 265100 Lighting

#### DIVISION 27 - COMMUNICATIONS

- 270500 Conduit for Technology and Communication Systems

#### DIVISION 32 - EXTERIOR IMPROVEMENTS

- 323113 Chain Link Fences and Gates



SE-310

## INVITATION FOR DESIGN-BID-BUILD CONSTRUCTION SERVICES

AGENCY/OWNER: Horry Georgetown Technical CollegePROJECT NAME: HGTC - Diesel Engine Program Interior RenovationPROJECT NUMBER: H59-N134-MJ CONSTRUCTION COST RANGE: \$1.7 M to \$1.9 M N/A PROJECT LOCATION: 470 Allied Dr. Conway SC

DESCRIPTION OF PROJECT/SERVICES: Renovation of an 13,500 SF existing pre-engineered metal building to include a large open lab, 2 classrooms, restrooms, and support spaces. Work consists of metal stud walls, hollow metal doors and frames, acoustical panel ceilings, and all new HVAC, lighting, and electrical systems, and other Work indicated in the Contract Documents. Due to cost break-down, prime bidder must possess at least 2 of the following licenses: Mechanical-AC, Mechanical-PB, Mechanical-EL or General-BD.

BID/SUBMITTAL DUE DATE: 2/10/2022 TIME: 2:00 PM NUMBER OF COPIES: 1

PROJECT DELIVERY METHOD: Design-Bid-BuildAGENCY PROJECT COORDINATOR: Dianna Cecala, Procurement ManagerEMAIL: Dianna.cecala@hgtc.edu TELEPHONE: 843-349-5207DOCUMENTS MAY BE OBTAINED FROM: www.hgtc.edu/purchasing**BID SECURITY IS REQUIRED IN AN AMOUNT NOT LESS THAN 5% OF THE BASE BID.**

PERFORMANCE AND LABOR & MATERIAL PAYMENT BONDS: The successful Contactor will be required to provide Performance and Labor and Material Payment Bonds, each in the amount of 100% of the Contract Price.

DOCUMENT DEPOSIT AMOUNT: \$ NA IS DEPOSIT REFUNDABLE Yes  No  N/A 

Bidders must obtain Bidding Documents/Plans from the above listed source(s) to be listed as an official plan holder. Bidders that rely on copies obtained from any other source do so at their own risk. All written communications with official plan holders & bidders will be via email or website posting.

Agency WILL NOT accept Bids sent via email.

*All questions & correspondence concerning this Invitation shall be addressed to the A/E.*A/E NAME: Quackenbush Architects + PlannersA/E CONTACT: Barbara HallerEMAIL: bhaller@quackenbusharchitects.com TELEPHONE: 803-771-2999PRE-BID CONFERENCE: Yes  No  MANDATORY ATTENDANCE: Yes  No PRE-BID DATE: 1/27/2022 TIME: 2:00 PMPRE-BID PLACE: HGTC Conway Campus, Building 100; Room 122 (Site Visit after the pre-bid)BID OPENING PLACE: HGTC Conway Campus, Building 100; Room 122

BID DELIVERY ADDRESSES:


## HAND-DELIVERY:

Attn: Ms. Dianna Cęcala, HGTC Procurement Manager  
2050 Hwy 501 E.  
Conway SC 29256

## MAIL SERVICE:

Attn: Ms. Dianna Cęcala, HGTC Procurement Manager  
2050 Hwy 501 E.  
Conway SC 29256

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? (Agency MUST check one) Yes  No 

APPROVED BY:  DATE: 1/13/22  
 (OSE Project Manager)

**South Carolina Division of Procurement  
Services, Office of State Engineer Version of  
 AIA<sup>®</sup> Document A701<sup>™</sup> – 2018**

***Instructions to Bidders***

This version of AIA Document A701<sup>™</sup>–2018 is modified by the South Carolina Division of Procurement Services, Office of State Engineer (“SCOSE”). Publication of this version of AIA Document A701–2018 does not imply the American Institute of Architects’ endorsement of any modification by SCOSE. A comparative version of AIA Document A701–2018 showing additions and deletions by SCOSE is available for review on the SCOSE Web site.

Cite this document as “AIA Document A701<sup>™</sup>– 2018, Instructions to Bidders — SCOSE Version,” or “AIA Document A701<sup>™</sup>–2018 — SCOSE Version.”

# South Carolina Division of Procurement Services, Office of State Engineer Version of **AIA Document A701™ – 2018**

## **Instructions to Bidders**

for the following Project:

*(Name, State Project Number, location, and detailed description)*

HGTC - Diesel Engine Training Facility Interior Renovation  
H59-N134-MJ  
470 Allied Drive, Conway SC 29526

### **THE OWNER:**

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

Horry Georgetown Technical College  
2050 Highway 501 East  
Conway, SC 29526

The Owner is a Governmental Body of the State of South Carolina as defined by S.C. Code Ann. § 11-35-310.

### **THE ARCHITECT:**

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

Quackenbush Architects + Planners, LLC  
1217 Hampton Street  
Columbia, SC 29201

This version of AIA Document A701-2018 is modified by the South Carolina Division of Procurement Services, Office of State Engineer. Publication of this version of AIA Document A701 does not imply the American Institute of Architects' endorsement of any modification by South Carolina Division of Procurement Services, Office of State Engineer. A comparative version of AIA Document A701–2018 showing additions and deletions by the South Carolina Division of Procurement Services, Office of State Engineer is available for review on South Carolina state Web site.

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

## **TABLE OF ARTICLES**

- 1 DEFINITIONS**
- 2 BIDDER'S REPRESENTATIONS**
- 3 BIDDING DOCUMENTS**
- 4 BIDDING PROCEDURES**
- 5 CONSIDERATION OF BIDS**
- 6 POST-BID INFORMATION**
- 7 PERFORMANCE BOND AND PAYMENT BOND**
- 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS**

## ARTICLE 1 DEFINITIONS

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

§ 1.1.1 Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA Document A101-2017 Standard Form of Agreement Between Owner and Contractor, SCOSE Version. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA Document A201-2017 General Conditions of the Contract for Construction, SCOSE Version.

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

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

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

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

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

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

§ 1.8 A Bidder is a person or entity who submits a Bid.

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

## ARTICLE 2 BIDDER'S REPRESENTATIONS

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

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, has correlated the Bidder's observations with the requirements of the Proposed Contract Documents, and accepts full responsibility for any pre-bid existing conditions that would affect the Bid that could have been ascertained by a site visit. As provided in S.C. Code Ann. Reg. 19-445.2042(B), a bidder's failure to attend an advertised pre-bid conference will not excuse its responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the State;
- .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 provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor; and
- .7 the Bidder understands that it may be required to accept payment by electronic funds transfer (EFT).

### § 2.2 Certification of Independent Price Determination

§ 2.2.1 GIVING FALSE, MISLEADING, OR INCOMPLETE INFORMATION ON THIS CERTIFICATION MAY RENDER YOU SUBJECT TO PROSECUTION UNDER SC CODE OF LAWS §16-9-10 AND OTHER APPLICABLE LAWS.

§ 2.2.2 By submitting a Bid, the Bidder certifies that:

- .1 The prices in this Bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to:
  - .1 those prices;
  - .2 the intention to submit a Bid; or
  - .3 the methods or factors used to calculate the prices offered.
- .2 The prices in this Bid have not been and will not be knowingly disclosed by the Bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and
- .3 No attempt has been made or will be made by the Bidder to induce any other concern to submit or not to submit a Bid for the purpose of restricting competition.

§ 2.2.3 Each signature on the Bid is considered to be a certification by the signatory that the signatory:

- .1 Is the person in the Bidder's organization responsible for determining the prices being offered in this Bid, and that the signatory has not participated and will not participate in any action contrary to Section 2.2.2 of this certification; or
- .2 Has been authorized, in writing, to act as agent for the Bidder's principals in certifying that those principals have not participated, and will not participate in any action contrary to Section 2.2.2 of this certification [As used in this subdivision, the term "principals" means the person(s) in the Bidder's organization responsible for determining the prices offered in this Bid];
- .3 As an authorized agent, does certify that the principals referenced in Section 2.2.3.2 of this certification have not participated, and will not participate, in any action contrary to Section 2.2.2 of this certification; and
- .4 As an agent, has not personally participated, and will not participate, in any action contrary to Section 2.2.2 of this certification.

§ 2.2.4 If the Bidder deletes or modifies Section 2.2.2.2 of this certification, the Bidder must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

§ 2.2.5 Drug Free Workplace Certification

By submitting a Bid, the Bidder certifies that, if awarded a contract, Bidder will comply with all applicable provisions of The Drug-free Workplace Act, S.C. Code Ann. 44-107-10, et seq.

§ 2.2.6 Certification Regarding Debarment and Other Responsibility Matters

§ 2.2.6.1 By submitting a Bid, Bidder certifies, to the best of its knowledge and belief, that:

- .1 Bidder and/or any of its Principals-
  - .1 Are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any state or federal agency;
  - .2 Have not, within a three-year period preceding this Bid, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of bids; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and
  - .3 Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in Section 2.2.6.1.1.2 of this provision.
- .2 Bidder has not, within a three-year period preceding this Bid, had one or more contracts terminated for default by any public (Federal, state, or local) entity.
- .3 "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

§ 2.2.6.2 Bidder shall provide immediate written notice to the Procurement Officer if, at any time prior to contract award, Bidder learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

§ 2.2.6.3 If Bidder is unable to certify the representations stated in Section 2.2.6.1, Bidder must submit a written explanation regarding its inability to make the certification. The certification will be considered in connection with a review of the Bidder's responsibility. Failure of the Bidder to furnish additional information as requested by the Procurement Officer may render the Bidder non-responsible.

§ 2.2.6.4 Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by Section 2.2.6.1 of this provision. The knowledge and information of a Bidder is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

§ 2.2.6.5 The certification in Section 2.2.6.1 of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Bidder knowingly or in bad faith rendered an erroneous certification, in addition to other remedies available to the State, the Procurement Officer may terminate the contract resulting from this solicitation for default.

### § 2.2.7 Ethics Certificate

By submitting a Bid, the Bidder certifies that the Bidder has and will comply with, and has not, and will not, induce a person to violate Title 8, Chapter 13 of the SC Code of Laws, as amended (Ethics Act). The following statutes require special attention: S.C. Code Ann. §8-13-700, regarding use of official position for financial gain; S.C. Code Ann. §8-13-705, regarding gifts to influence action of public official; S.C. Code Ann. §8-13-720, regarding offering money for advice or assistance of public official; S.C. Code Ann. §8-13-755 and §8-13-760, regarding restrictions on employment by former public official; S.C. Code Ann. §8-13-775, prohibiting public official with economic interests from acting on contracts; S.C. Code Ann. §8-13-790, regarding recovery of kickbacks; S.C. Code Ann. §8-13-1150, regarding statements to be filed by consultants; and S.C. Code Ann. §8-13-1342, regarding restrictions on contributions by contractor to candidate who participated in awarding of contract. The State may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision. If the contractor participates, directly or indirectly, in the evaluation or award of public contracts, including without limitation, change orders or task orders regarding a public contract, the contractor shall, if required by law to file such a statement, provide the statement required by S.C. Code Ann. §8-13-1150 to the Procurement Officer at the same time the law requires the statement to be filed.

### § 2.2.8 Restrictions Applicable To Bidders & Gifts

Violation of these restrictions may result in disqualification of your Bid, suspension or debarment, and may constitute a violation of the state Ethics Act.

§ 2.2.8.1 After issuance of the solicitation, Bidder agrees not to discuss this procurement activity in any way with the Owner or its employees, agents or officials. All communications must be solely with the Procurement Officer. This restriction may be lifted by express written permission from the Procurement Officer. This restriction expires once a contract has been formed.

§ 2.2.8.2 Unless otherwise approved in writing by the Procurement Officer, Bidder agrees not to give anything to the Owner, any affiliated organizations, or the employees, agents or officials of either, prior to award.

§ 2.2.8.3 Bidder acknowledges that the policy of the State is that a governmental body should not accept or solicit a gift, directly or indirectly, from a donor if the governmental body has reason to believe the donor has or is seeking to obtain contractual or other business or financial relationships with the governmental body. SC Regulation 19-445.2165(C) broadly defines the term donor.

### § 2.2.9 Open Trade Representation

By submitting a Bid, the Bidder represents that Bidder is not currently engaged in the boycott of a person or an entity based in or doing business with a jurisdiction with whom South Carolina can enjoy open trade, as defined in S.C. Code Ann. §11-35-5300.

## ARTICLE 3 BIDDING DOCUMENTS

### § 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

§ 3.1.2 Any required deposit shall be refunded to all plan holders who return the paper Bidding Documents in good condition within ten (10) days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

### § 3.1.3 Reserved

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

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

§ 3.1.6 All persons obtaining Bidding Documents from the issuing office designated in the advertisement shall provide that office with Bidder's contact information to include the Bidder's name, telephone number, mailing address, and email address.

### § 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2. Failure to do so will be at the Bidder's risk. Bidder assumes responsibility for any patent ambiguity that Bidder does not bring to the Architect's attention prior to Bid Opening.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least ten (10) days prior to the date for receipt of Bids.

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

§ 3.2.4 As provided in S.C. Code Ann. Reg. 19-445.2042(B), nothing stated at the Pre-bid conference shall change the Bidding Documents unless a change is made by Addendum.

### § 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution. Where "brand name or equal" is used in the Bidding Documents, the listing description is not intended to limit or restrict competition.

#### § 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten (10) days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

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

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

§ 3.3.2.4 No request to substitute materials, products, or equipment for materials, products, or equipment described in the Bidding Documents and no request for addition of a manufacturer or supplier to a list of approved manufacturers or suppliers in the Bidding Documents will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten (10) days prior to the date for receipt of Bids established in the invitation to bid.

Any subsequent extension of the date for receipt of Bids by addendum shall not extend the date for receipt of such requests unless the addendum so specifies. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the Work of other contracts that incorporation of the proposed substitution would require, shall be included.

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

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

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

#### § 3.4 Addenda

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

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

§ 3.4.3 Addenda will be issued at least five (5) business days before the day of the Bid Opening, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids. A business day runs from midnight to midnight and excludes weekends and state and federal holidays.

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

§ 3.4.5 When the date for receipt of Bids is to be postponed and there is insufficient time to issue an Addendum prior to the original Bid Date, the Owner will notify prospective Bidders by telephone or other appropriate means with immediate follow up with an Addendum. This Addendum will verify the postponement of the original Bid Date and establish a new Bid Date. The new Bid Date will be no earlier than the fifth (5th) business day after the date of issuance of the Addendum postponing the original Bid Date.

§ 3.4.6 If an emergency or unanticipated event interrupts normal government processes so that Bids cannot be received at the government office designated for receipt of Bids by the exact time specified in the solicitation, the time specified for receipt of Bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal government processes resume. In lieu of an automatic extension, an Addendum may be issued to reschedule Bid Opening. If state offices are closed in the county in which Bids are to be received at the time a pre-bid or pre-proposal conference is scheduled, an Addendum will be issued to reschedule the conference. Bidders shall visit <https://www.scemd.org/closings/> for information concerning closings.

### ARTICLE 4 BIDDING PROCEDURES

#### § 4.1 Preparation of Bids

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

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

§ 4.1.3 Sums shall be expressed in numbers.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid. Bidder shall not make stipulations or qualify his Bid in any manner not permitted on the Bid Form. An incomplete Bid or information not requested that is written on or attached to the Bid Form that could be considered a qualification of the Bid, may be cause for rejection of the Bid.

§ 4.1.5 All requested Alternates shall be bid. The failure of the Bidder to indicate a price for an Alternate shall render the Bid non-responsive. Indicate the change to the Base Bid by entering the dollar amount and marking, as appropriate, the box for "ADD TO" or "DEDUCT FROM". If no change in the Base Bid is required, enter "ZERO" or "No Change".



§ 4.1.6 Pursuant to S.C. Code Ann. § 11-35-3020(b)(i), as amended, Section 7 of the Bid Form sets forth a list of proposed subcontractors for which the Bidder is required to identify those subcontractors the Bidder will use to perform the work listed. Bidder must follow the instructions in the Bid Form for filling out this section of the Bid Form. Failure to properly fill out Section 7 may result in rejection of Bidder's bid as non-responsive.

§ 4.1.7 Contractors and subcontractors listed in Section 7 of the Bid Form who are required by the South Carolina Code of Laws to be licensed, must be licensed as required by law at the time of bidding.

§ 4.1.8 Each copy of the Bid shall state the legal name and legal status of the Bidder. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract.

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

## § 4.2 Bid Security

§ 4.2.1 If required by the invitation to bid, each Bid shall be accompanied by a bid security in an amount of not less than five percent of the Base Bid. The bid security shall be a bid bond or a certified cashier's check.

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

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bid Bond shall:

- .1 be issued by a surety company licensed to do business in South Carolina;
- .2 be issued by a surety company having, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty", which company shows a financial strength rating of at least five (5) times the contract price.
- .3 be enclosed in the bid envelope at the time of Bid Opening, either in paper copy or as an electronic bid bond authorization number provided on the Bid Form and issued by a firm or organization authorized by the surety to receive, authenticate and issue binding electronic bid bonds on behalf of the surety.

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

§ 4.2.5 By submitting a Bid Bond via an electronic bid bond authorization number on the Bid Form and signing the Bid Form, the Bidder certifies that an electronic bid bond has been executed by a Surety meeting the standards required by the Bidding Documents and the Bidder and Surety are firmly bound unto the State of South Carolina under the conditions provided in this Section 4.2.

## § 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

§ 4.3.2 All paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall, unless hand delivered by the Bidder, be addressed to the Owner's designated purchasing office as shown in the invitation to bid. The envelope shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, or special delivery service (UPS, Federal Express, etc.), the sealed envelope shall be labelled "SEALED BID ENCLOSED" on the face thereof. Bidders hand delivering their Bids shall deliver Bids to the place of the Bid Opening as shown in the invitation for bids. Whether or not Bidders attend the Bid Opening, they shall give their Bids to the Owner's Procurement Officer or his/her designee as shown in the invitation to bid prior to the time of the Bid Opening.

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

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

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted. Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.3.6 The official time for receipt of Bids will be determined by reference to the clock designated by the Owner's Procurement Officer or his/her designee. The Procurement Officer conducting the Bid Opening will determine and announce that the deadline has arrived and no further Bids or bid modifications will be accepted. All Bids and bid modifications in the possession of the Procurement Officer at the time the announcement is completed will be timely, whether or not the bid envelope has been date/time stamped or otherwise marked by the Procurement Officer.

#### § 4.4 Modification or Withdrawal of Bid

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

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

### ARTICLE 5 CONSIDERATION OF BIDS

#### § 5.1 Opening of Bids

Bids received on time will be publicly opened and read aloud. The Owner will not read aloud Bids that the Owner determines, at the time of opening, to be non-responsive.

§ 5.1.1 At Bid Opening, the Owner will announce the date and location of the posting of the Notice of Intend to Award. If the Owner determines to award the Project, the Owner will, after posting a Notice of Intend to Award, send a copy of the Notice to all Bidders.

§ 5.1.2 The Owner will send a copy of the final Bid Tabulation to all Bidders within ten (10) working days of the Bid Opening.

§ 5.1.3 If only one Bid is received, the Owner will open and consider the Bid.

#### § 5.2 Rejection of Bids

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

§ 5.2.2 The reasons for which the Owner will reject Bids include, but are not limited to:

- .1 Failure by a Bidder to be represented at a Mandatory Pre-Bid Conference or site visit;
- .2 Failure to deliver the Bid on time;
- .3 Failure to comply with Bid Security requirements, except as expressly allowed by law;
- .4 Listing an invalid electronic Bid Bond authorization number on the Bid Form;
- .5 Failure to Bid an Alternate, except as expressly allowed by law;
- .6 Failure to list qualified subcontractors as required by law;
- .7 Showing any material modification(s) or exception(s) qualifying the Bid;
- .8 Faxing a Bid directly to the Owner or Owner's representative; or
- .9 Failure to include a properly executed Power-of-Attorney with the Bid Bond.

§ 5.2.3 The Owner may reject a Bid as nonresponsive if the prices bid are materially unbalanced between line items or sub-line items. A Bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the Bid

will result in the lowest overall cost to the Owner even though it may be the low evaluated Bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

### § 5.3 Acceptance of Bid (Award)

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

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

## ARTICLE 6 POST-BID INFORMATION

### § 6.1 Contractor's Responsibility

Owner will make a determination of Bidder's responsibility before awarding a contract. Bidder shall provide all information and documentation requested by the Owner to support the Owner's evaluation of responsibility. Failure of Bidder to provide requested information is cause for the Owner, at its option, to determine the Bidder to be non-responsible.

### § 6.2 Reserved

### § 6.3 Submittals

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

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

### § 6.4 Posting of Intent To Award

The Notice of Intent to Award will be posted at the following location:

**Room or Area of Posting:** Room 120

**Building Where Posted:** Building 100

**Address of Building:** 2050 Hwy 501 E, Conway, SC 29526

**WEB site address (if applicable):** [www.hgtc.edu/purchasing](http://www.hgtc.edu/purchasing)

**Posting date will be announced at Bid Opening.** In addition to posting the Notice, the Owner will promptly send all responsive Bidders a copy of the Notice of Intent to Award and the final bid tabulation

### § 6.5 Protest of Solicitation or Award

§ 6.5.1 If you are aggrieved in connection with the solicitation or award of a contract, you may be entitled to protest, but only as provided in S.C. Code Ann. § 11-35-4210. To protest a solicitation, you must submit a protest within fifteen (15) days of the date the applicable solicitation document is issued. To protest an award, you must (i) submit notice of your intent to protest within seven (7) business days of the date the award notice is posted, and (ii) submit your actual protest within fifteen (15) days of the date the award notice is posted. Days are calculated as provided in Section 11-35-310(13). Both protests and notices of intent to protest must be in writing and must be received by the State Engineer within the time provided. The grounds of the protest and the relief requested must be set forth with enough particularity to give notice of the issues to be decided.

§ 6.5.2 Any protest must be addressed to the CPO, Office of State Engineer, and submitted in writing:

- .1 by email to [protest-ose@mmo.sc.gov](mailto:protest-ose@mmo.sc.gov),
- .2 by facsimile at 803-737-0639, or
- .3 by post or delivery to 1201 Main Street, Suite 600, Columbia, SC 29201.

By submitting a protest to the foregoing email address, you (and any person acting on your behalf) consent to receive communications regarding your protest (and any related protests) at the e-mail address from which you sent your protest.

Init.

**ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND**

**§ 7.1 Bond Requirements**

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

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the state of South Carolina.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of 100% of the Contract Sum.

**§ 7.2 Time of Delivery of Contract, Certificates of Insurance, and Form of Bonds**

§ 7.2.1 Following expiration of the protest period, the Owner will forward the Contract for Construction to the Bidder for signature. The Bidder shall return the fully executed Contract for Construction to the Owner within seven (7) days. The Bidder shall deliver the required bonds and certificate of insurance to the Owner not later than three (3) days following the date of execution of the Contract. Failure to deliver these documents as required shall entitle the Owner to consider the Bidder’s failure as a refusal to enter into a contract in accordance with the terms and conditions of the Bidder’s Bid and to make claim on the Bid Security for re-procurement cost.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on the Performance Bond and Payment Bond forms included in the Bid Documents.

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

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

**ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS**

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

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, SCOSE Version.
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, SCOSE Version.
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, SCOSE Version.
- .4 Drawings

Number	Title	Date
	See Index of Drawings on Cover of Drawing Set	

- .5 Specifications

Section	Title	Date	Pages
	See Project Manual Table of Contents		

.6 Addenda:

Number	Date	Pages
--------	------	-------

.7 Other Exhibits:

*(Check all boxes that apply and include appropriate information identifying the exhibit where required.)*

- AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
- AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
- The Sustainability Plan:
- Supplementary and other Conditions of the Contract:

.8 Other documents listed below:

*(List here any additional documents that are intended to form part of the Proposed Contract Documents.)*

**ARTICLE 9 Miscellaneous**

**§ 9.1 Nonresident Taxpayer Registration Affidavit Income Tax Withholding Important Tax Notice - Nonresidents Only**

**§ 9.1.1** Withholding Requirements for Payments to Nonresidents: SC Code of Laws §12-8-550 requires persons hiring or contracting with a nonresident conducting a business or performing personal services of a temporary nature within South Carolina to withhold 2% of each payment made to the nonresident. The withholding requirement does not apply to (1) payments on purchase orders for tangible personal property when the payments are not accompanied by services to be performed in South Carolina, (2) nonresidents who are not conducting business in South Carolina, (3) nonresidents for contracts that do not exceed \$10,000 in a calendar year, or (4) payments to a nonresident who (a) registers with either the S.C. Department of Revenue or the S.C. Secretary of State and (b) submits a Nonresident Taxpayer Registration Affidavit - Income Tax Withholding, Form I-312 to the person letting the contract.

**§ 9.1.2** For information about other withholding requirements (e.g., employee withholding), contact the Withholding Section at the South Carolina Department of Revenue at 803-898-5383 or visit the Department's website at: [www.sctax.org](http://www.sctax.org)

**§ 9.1.3** This notice is for informational purposes only. This Owner does not administer and has no authority over tax issues. All registration questions should be directed to the License and Registration Section at 803-898-5872 or to the South Carolina Department of Revenue, Registration Unit, Columbia, S.C. 29214-0140. All withholding questions should be directed to the Withholding Section at 803-898-5383.

PLEASE SEE THE "NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING" FORM (Available through SC Department of Revenue).

## § 9.2 Submitting Confidential Information

§ 9.2.1 For every document the Bidder submits in response to or with regard to this solicitation or request, the Bidder must separately mark with the word "CONFIDENTIAL" every page, or portion thereof, that the Bidder contends contains information that is exempt from public disclosure because it is either (a) a trade secret as defined in Section 30-4-40(a)(1), or (b) privileged & confidential, as that phrase is used in SC Code of Laws §11-35-410.

§ 9.2.2 For every document the Bidder submits in response to or with regard to this solicitation or request, the Bidder must separately mark with the words "TRADE SECRET" every page, or portion thereof, that the Bidder contends contains a trade secret as that term is defined by SC Code of Laws §39-8-20.

§ 9.2.3 For every document the Bidder submits in response to or with regard to this solicitation or request, the Bidder must separately mark with the word "PROTECTED" every page, or portion thereof, that the Bidder contends is protected by SC Code of Laws §11-35-1810.

§ 9.2.4 All markings must be conspicuous; use color, bold, underlining, or some other method in order to conspicuously distinguish the mark from the other text. Do not mark your entire Bid as confidential, trade secret, or protected! If your Bid, or any part thereof, is improperly marked as confidential or trade secret or protected, the State may, in its sole discretion, determine it nonresponsive. If only portions of a page are subject to some protection, do not mark the entire page.

§ 9.2.5 By submitting a response to this solicitation, Bidder (1) agrees to the public disclosure of every page of every document regarding this solicitation or request that was submitted at any time prior to entering into a contract (including, but not limited to, documents contained in a response, documents submitted to clarify a response, & documents submitted during negotiations), unless the page is conspicuously marked "TRADE SECRET" or "CONFIDENTIAL" or "PROTECTED", (2) agrees that any information not marked, as required by these bidding instructions, as a "Trade Secret" is not a trade secret as defined by the Trade Secrets Act, & (3) agrees that, notwithstanding any claims or markings otherwise, any prices, commissions, discounts, or other financial figures used to determine the award, as well as the final contract amount, are subject to public disclosure.

§ 9.2.6 In determining whether to release documents, the State will detrimentally rely on the Bidders' marking of documents, as required by these bidding instructions, as being either "Confidential" or "Trade Secret" or "PROTECTED".

§ 9.2.7 By submitting a response, the Bidder agrees to defend, indemnify & hold harmless the State of South Carolina, its officers & employees, from every claim, demand, loss, expense, cost, damage or injury, including attorney's fees, arising out of or resulting from the State withholding information that Bidder marked as "confidential" or "trade secret" or "PROTECTED".

## § 9.3 Solicitation Information From Sources Other Than Official Source

South Carolina Business Opportunities (SCBO) is the official state government publication for State of South Carolina solicitations. Any information on State agency solicitations obtained from any other source is unofficial and any reliance placed on such information is at the Bidder's sole risk and is without recourse under the South Carolina Consolidated Procurement Code.

## § 9.4 Builder's Risk Insurance

Bidders are directed to Exhibit A of the AIA Document A101, 2017 SCOSE Version, which, unless provided otherwise in the Bid Documents, requires the contractor to provide builder's risk insurance on the project.

## § 9.5 Tax Credit For Subcontracting With Minority Firms

§ 9.5.1 Pursuant to S.C. Code Ann. §12-6-3350, taxpayers, who utilize certified minority subcontractors, may take a tax credit equal to 4% of the payments they make to said subcontractors. The payments claimed must be based on work performed directly for a South Carolina state contract. The credit is limited to a maximum of fifty thousand dollars annually. The taxpayer is eligible to claim the credit for 10 consecutive taxable years beginning with the taxable year in which the first payment is made to the subcontractor that qualifies for the credit. After the above ten consecutive taxable years, the taxpayer is no longer eligible for the credit. The credit may be claimed on Form TC-2, "Minority Business Credit." A copy of the subcontractor's certificate from the Governor's Office of Small and Minority Business (OSMBA) is to be attached to the contractor's income tax return.

§ 9.5.2 Taxpayers must maintain evidence of work performed for a State contract by the minority subcontractor. Questions regarding the tax credit and how to file are to be referred to: SC Department of Revenue, Research and Review, Phone: (803) 898-5786, Fax: (803) 898-5888.

§ 9.5.3 The subcontractor must be certified as to the criteria of a "Minority Firm" by the Governor's Office of Small and Minority Business Assistance (OSMBA). Certificates are issued to subcontractors upon successful completion of the certification process. Questions regarding subcontractor certification are to be referred to: Governor's Office of Small and Minority Business Assistance, Phone: (803) 734-0657, Fax: (803) 734-2498. Reference: S.C. Code Ann. §11-35-5010 – Definition for Minority Subcontractor & S.C. Code Ann. §11-35-5230 (B) – Regulations for Negotiating with State Minority Firms.

## § 9.6 Other Special Conditions Of The Work

**BID BOND**

BID BOND is the AIA document A310, latest edition, published by the American Institute of Architects.

The A310 document is not included, but may be viewed at the Architect's office or purchased from the American Institute of Architects.

END OF SECTION



# SE-330 LUMP SUM BID FORM

*Bidders shall submit bids on only Bid Form SE-330.*

**BID SUBMITTED BY:** \_\_\_\_\_  
(Bidder's Name)

**BID SUBMITTED TO:** Horry Georgetown Technical College  
(Agency's Name)

**FOR: PROJECT NAME:** HGTC - Diesel Engine Training Facility Interior Renovation  
**PROJECT NUMBER:** H59-N134-MJ

## **OFFER**

- § 1. In response to the Invitation for Construction Services and in compliance with the Instructions to Bidders for the above-named Project, the undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with the Agency on the terms included in the Bidding Documents, and to perform all Work as specified or indicated in the Bidding Documents, for the prices and within the time frames indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.
- § 2. Pursuant to SC Code § 11-35-3030(1), Bidder has submitted Bid Security in the amount and form required by the Bidding Documents.
- § 3. Bidder acknowledges the receipt of the following Addenda to the Bidding Documents and has incorporated the effects of said Addenda into this Bid:  
(Bidder, check all that apply. Note, there may be more boxes than actual addenda. Do not check boxes that do not apply)
- ADDENDA:**             #1             #2             #3             #4             #5
- § 4. Bidder accepts all terms and conditions of the Invitation for Bids, including, without limitation, those dealing with the disposition of Bid Security. Bidder agrees that this Bid, including all Bid Alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of **60** Days following the Bid Date, or for such longer period of time that Bidder may agree to in writing upon request of the Agency.
- § 5. Bidder herewith offers to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the following items of construction work:
- § 6.1 **BASE BID WORK** (as indicated in the Bidding Documents and generally described as follows): Renovation of an 13,500SF existing pre-engineered metal building to include a large open lab, 2 classrooms, restrooms, and support spaces. Work consists of metal stud walls, hollow metal doors and frames, acoustical panel ceilings, and all new HVAC, lighting, and electrical systems, and other Work indicated in the Contract Documents.

\$ \_\_\_\_\_, which sum is hereafter called the Base Bid.

(Bidder to insert Base Bid Amount on line above)

**SE-330**  
**LUMP SUM BID FORM**

*Bidders shall submit bids on only Bid Form SE-330.*

**§ 6.2 BID ALTERNATES** as indicated in the Bidding Documents and generally described as follows:

**ALTERNATE # 1** (Brief Description): Replace 2 existing coiling doors with one large coiling door per the contract documents.

**ADD TO** or  **DEDUCT FROM BASE BID: \$** \_\_\_\_\_

*(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)*

**ALTERNATE # 2** (Brief Description): \_\_\_\_\_

**ADD TO** or  **DEDUCT FROM BASE BID: \$** \_\_\_\_\_

*(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)*

**ALTERNATE # 3** (Brief Description): \_\_\_\_\_

**ADD TO** or  **DEDUCT FROM BASE BID: \$** \_\_\_\_\_

*(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)*

**§ 6.3 UNIT PRICES:**

**BIDDER** offers for the Agency’s consideration and use, the following **UNIT PRICES**. The **UNIT PRICES** offered by **BIDDER** indicate the amount to be added to or deducted from the **CONTRACT SUM** for each item-unit combination. **UNIT PRICES** include all costs to the Agency, including those for materials, labor, equipment, tools of trades and labor, fees, taxes, insurance, bonding, overhead, profit, etc. The Agency reserves the right to include or not to include any of the following **UNIT PRICES** in the Contract and to negotiate the **UNIT PRICES** with **BIDDER** prior to including in the Contract.

<u>No.</u>	<u>ITEM</u>	<u>UNIT OF MEASURE</u>	<u>ADD</u>	<u>DEDUCT</u>
<u>1.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____
<u>2.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____
<u>3.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____
<u>4.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____
<u>5.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____
<u>6.</u>	_____	_____	<u>\$</u> _____	<u>\$</u> _____

**SE-330  
LUMP SUM BID FORM**

**§ 7. LISTING OF PROPOSED SUBCONTRACTORS PURSUANT TO SECTION 3020(b)(i), CHAPTER 35, TITLE 11 OF THE SOUTH CAROLINA CODE OF LAWS, AS AMENDED**  
*(See Instructions on the following page BF-2A)*

Bidder shall use the below-listed Subcontractors in the performance of the Subcontractor Classification work listed:

<b>(A) SUBCONTRACTOR LICENSE CLASSIFICATION or SUBCLASSIFICATION NAME <i>(Completed by Agency)</i></b>	<b>(B) LICENSE CLASSIFICATION or SUBCLASSIFICATION ABBREVIATION <i>(Completed by Agency)</i></b>	<b>(C) SUBCONTRACTOR and/or PRIME CONTRACTOR <i>(Required - must be completed by Bidder)</i></b>	<b>(D) SUBCONTRACTOR'S and/or PRIME CONTRACTOR'S SC LICENSE NUMBER <i>(Requested, but not Required)</i></b>
<b>BASE BID</b>			
No Subcontractor Listing Required			
<b>ALTERNATE #1</b>			
<b>ALTERNATE #2</b>			
<b>ALTERNATE #3</b>			

If a Bid Alternate is accepted, Subcontractors listed for the Bid Alternate shall be used for the work of both the Alternate and the Base Bid work.

## SE-330 LUMP SUM BID FORM

### § 8. LIST OF MANUFACTURERS, MATERIAL SUPPLIERS, AND SUBCONTRACTORS OTHER THAN SUBCONTRACTORS LISTED IN SECTION 7 ABOVE (*FOR INFORMATION ONLY*):

Pursuant to instructions in the Invitation for Construction Services, if any, Bidder will provide to Agency upon the Agency's request and within 24 hours of such request, a listing of manufacturers, material suppliers, and subcontractors, other than those listed in Section 7 above, that Bidder intends to use on the project. Bidder acknowledges and agrees that this list is provided for purposes of determining responsibility and not pursuant to the subcontractor listing requirements of SC Code § 11-35-3020(b)(i).

### § 9. TIME OF CONTRACT PERFORMANCE AND LIQUIDATED DAMAGES

#### a) CONTRACT TIME

Bidder agrees that the Date of Commencement of the Work shall be established in a Notice to Proceed to be issued by the Agency. Bidder agrees to substantially complete the Work within 164 Calendar Days from the Date of Commencement, subject to adjustments as provided in the Contract Documents.

#### b) LIQUIDATED DAMAGES

Bidder further agrees that from the compensation to be paid, the Agency shall retain as Liquidated Damages the amount of \$ 250 for each Calendar Day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. This amount is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty for nonperformance.

### § 10. AGREEMENTS

- a) Bidder agrees that this bid is subject to the requirements of the laws of the State of South Carolina.
- b) Bidder agrees that at any time prior to the issuance of the Notice to Proceed for this Project, this Project may be canceled for the convenience of, and without cost to, the State.
- c) Bidder agrees that neither the State of South Carolina nor any of its agencies, employees or agents shall be responsible for any bid preparation costs, or any costs or charges of any type, should all bids be rejected or the Project canceled for any reason prior to the issuance of the Notice to Proceed.

### § 11. ELECTRONIC BID BOND

By signing below, the Principal is affirming that the identified electronic bid bond has been executed and that the Principal and Surety are firmly bound unto the State of South Carolina under the terms and conditions of the AIA Document A310, Bid Bond, referenced in the Bidding Documents.

**ELECTRONIC BID BOND NUMBER:** \_\_\_\_\_

**SIGNATURE AND TITLE:** \_\_\_\_\_

**SE-330  
LUMP SUM BID FORM**

**CONTRACTOR'S CLASSIFICATIONS AND SUBCLASSIFICATIONS WITH LIMITATION**

**SC Contractor's License Number(s):** \_\_\_\_\_

**Classification(s) & Limits:** \_\_\_\_\_

**Subclassification(s) & Limits:** \_\_\_\_\_

**By signing this Bid, the person signing reaffirms all representation and certification made by both the person signing and the Bidder, including without limitation, those appearing in Article 2 of the SCOSE Version of the AIA Document A701, Instructions to Bidders, is expressly incorporated by reference.**

**BIDDER'S LEGAL NAME:** \_\_\_\_\_

**ADDRESS:** \_\_\_\_\_

\_\_\_\_\_

**TELEPHONE:** \_\_\_\_\_

**EMAIL:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**PRINT NAME:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**South Carolina Division of Procurement  
Services, Office of State Engineer Version of  
 AIA<sup>®</sup> Document A101<sup>®</sup> – 2017**

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

This version of AIA Document A101<sup>®</sup>–2017 is modified by the South Carolina Division of Procurement Services, Office of State Engineer (“SCOSE”). Publication of this version of AIA Document A101–2017 does not imply the American Institute of Architects’ endorsement of any modification by SCOSE. A comparative version of AIA Document A101–2017 showing additions and deletions by SCOSE is available for review on the SCOSE Web site.

Cite this document as “AIA Document A101<sup>®</sup>–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum — SCOSE Version,” or “AIA Document A101<sup>®</sup>–2017 — SCOSE Version.”

# South Carolina Division of Procurement Services, Office of State Engineer Version of AIA® Document A101® – 2017

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

**AGREEMENT** made as of the \_\_\_\_\_ day of \_\_\_\_\_  
in the year \_\_\_\_\_  
*(In words, indicate day, month and year.)*

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

Horry Georgetown Technical College  
2050 Highway 501 East  
Conway, SC 29526

The Owner is a Governmental Body of the State of South Carolina as defined in S.C. Code Ann. § 11-35-310.

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

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

HGTC - Diesel Engine Training Facility Interior Renovation  
H59-N135-MJ A  
470 Allied Drive, Conway SC 29526

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

Quackenbush Architects + Planners, LLC  
1217 Hampton Street  
Columbia, SC 29201

The Owner and Contractor agree as follows.

This version of AIA Document A101–2017 is modified by the South Carolina Division of Procurement Services, Office of State Engineer. Publication of this version of AIA Document A101 does not imply the American Institute of Architects' endorsement of any modification by South Carolina Division of Procurement Services, Office of State Engineer. A comparative version of AIA Document A101–2017 showing additions and deletions by the South Carolina Division of Procurement Services, Office of State Engineer is available for review on South Carolina state Web site.

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

Init.

AIA Document A101® – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007, and 2017 by The American Institute of Architects. All rights reserved. **South Carolina Division of Procurement Services, Office of State Engineer Version of AIA Document A101®–2017.** Copyright © 2016 and 2020 by The American Institute of Architects. All rights reserved. **The "American Institute of Architects," "AIA," the AIA Logo, "A101," and "AIA Contract Documents" are registered trademarks and may not be used without permission.** This document was created on 12/16/2021 10:41:33 under the terms of AIA Documents on Demand® Order No.2114271517, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Documents-on-Demand - End User License Agreement. To report copyright violations, e-mail [copyright@aia.org](mailto:copyright@aia.org).

## TABLE OF ARTICLES

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

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

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

**§ 1.2** Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101-2017 Standard Form of Agreement Between Owner and Contractor, SCOSE Version. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201-2017 General Conditions of the Contract for Construction, SCOSE Version.

### ARTICLE 2 THE WORK OF THIS CONTRACT

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

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

**§ 3.1** The Date of Commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner. The Owner shall issue the Notice to Proceed to the Contractor in writing, no less than seven (7) days prior to the Date of Commencement. Unless otherwise provided elsewhere in the Contract Documents and provided the Contractor has secured all required insurance and surety bonds, the Contractor may commence work immediately after receipt of the Notice to Proceed.

**§ 3.2** The Contract Time as provided in the Notice to Proceed for this project shall be measured from the Date of Commencement of the Work to Substantial Completion.

#### **§ 3.3 Substantial Completion**

**§ 3.3.1** Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work within the Contract Time indicated in the Notice to Proceed.

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

Init.



**ARTICLE 4 CONTRACT SUM**

**§ 4.1** The Owner shall pay the Contractor the Contract Sum, including all accepted alternates indicated in the bid documents, in current funds for the Contractor’s performance of the Contract. The Contract Sum shall be

(\$ \_\_\_\_\_), subject to additions and deductions as provided in the Contract Documents.

**§ 4.2 Alternates**

**§ 4.2.1** Alternates that are accepted, if any, included in the Contract Sum:

*(Insert the accepted Alternates.)*

Item	Price
------	-------

**§ 4.3** Allowances, if any, included in the Contract Sum:

*(Identify each allowance.)*

Item	Price
------	-------

**§ 4.4** Unit prices, if any:

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

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

**§ 4.5 Liquidated damages**

**§ 4.5.1** Contractor agrees that from the compensation to be paid, the Owner shall retain as liquidated damages the amount indicated in Section 9(b) of the Bid Form for each calendar day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. The liquidated damages amount is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty.

**§ 4.6** Other:

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

Init.

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

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

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

§ 5.1.3 The Owner shall make payment of the certified amount to the Contractor not later than twenty-one (21) days after receipt of the Application for Payment.

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

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

§ 5.1.6 Subject to S.C. Code Ann. § 12-8-550 (Withholding Requirements for Payments to Non-Residents), in accordance with AIA Document A201®–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

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

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

### § 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold three and one-half percent (3.5%), as retainage, from the payment otherwise due.

§ 5.1.7.2 When a portion, or division, of Work as listed in the Schedule of Values is 100% complete, that portion of the retained funds which is allocable to the completed division must be released to the Contractor. No later than ten (10) days after receipt of retained funds from the Owner, the Contractor shall pay to the subcontractor responsible for such completed work the full amount of retainage allocable to the subcontractor's work.

§ 5.1.7.3 Upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7.

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

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

## § 5.2 Final Payment

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

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner’s final payment to the Contractor shall be made no later than twenty-one (21) days after the issuance of the Architect’s final Certificate for Payment.

## ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Claims and disputes shall be resolved in accordance with Article 15 of AIA Document A201–2017.

## ARTICLE 7 TERMINATION OR SUSPENSION

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

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

## ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner’s representative:

§ 8.2.1 The Owner designates the individual listed below as its Senior Representative (“Owner’s Senior Representative”), which individual has the responsibility for and, subject to Section 7.2.1 of the General Conditions, the authority to resolve disputes under Section 15.6 of the General Conditions:

**Name:** Dianna Cecala  
**Title:** Procurement Manager  
**Address:** 2050 Hwy 501E, Conway SC 29528  
**Telephone:** 843-349-5207  
**Email:** Dianna.cecala@hgtc.edu

§ 8.2.2 The Owner designates the individual listed below as its Owner’s Representative, which individual has the authority and responsibility set forth in Section 2.1.1 of the General Conditions:

**Name:** Kevin Brown  
**Title:** Superintendent of Bldg/Grounds, Physical Plant - Conway  
**Address:** 2050 Hwy 501E, Conway SC 29528  
**Telephone:** 843-349-5398  
**Email:** Kevin.Brown@hgtc.edu

§ 8.3 The Contractor’s representative:

§ 8.3.1 The Contractor designates the individual listed below as its Senior Representative (“Contractor’s Senior Representative”), which individual has the responsibility for and authority to resolve disputes under Section 15.6 of the General Conditions:

**Name:**

Init.

**Title:**  
**Address:**  
**Telephone:**  
**Email:**

§ 8.3.2 The Contractor designates the individual listed below as its Contractor's Representative, which individual has the authority and responsibility set forth in Section 3.1.1 of the General Conditions:

**Name:**  
**Title:**  
**Address:**  
**Telephone:**  
**Email:**

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

§ 8.5 The Architect's representative:

**Name:** Barbara Haller  
**Title:** Architect  
**Address:** 1217 Hampton St., Columbia SC 29201  
**Telephone:** 803-771-2999  
**Email:** BHaller@QuackenbushArchitects.com

#### § 8.6 Insurance and Bonds

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

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

§ 8.7 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

*(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)*

#### § 8.8 Other Provisions:

§ 8.8.1 Additional requirements, if any, for the Contractor's Construction Schedule are as follows:

*(Check box if applicable to this Contract)*

The Construction Schedule shall be in a detailed precedence-style critical path management (CPM) or primavera-type format satisfactory to the Owner and the Architect that shall also (1) provide a graphic representation of all activities and events that will occur during performance of the Work; (2) identify each phase of construction and occupancy; and (3) set forth milestone dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents.

- .1 Upon review by the Owner and the Architect for conformance with milestone dates and Construction Time given in the Bidding Documents, with associated Substantial Completion date, the Construction Schedule shall be deemed part of the Contract Documents and attached to the Agreement as an Exhibit. If returned for non-conformance, the Construction Schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted.

- .2 The Contactor shall monitor the progress of the Work for conformance with the requirements of the Construction Schedule and shall promptly advise the Owner of any delays or potential delays. Whenever the Construction Schedule no longer reflects actual conditions and progress of the Work or the Contract Time is modified in accordance with the terms of the Contract Documents, the Contractor shall update the Construction Schedule to reflect such conditions.
- .3 In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary.
- .4 In no event shall any progress report constitute an adjustment in the Contract Time, any milestone date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 8.8.2 The Owner’s review of the Contractor’s schedule is not conducted for the purpose of either determining its accuracy, completeness, or approving the construction means, methods, techniques, sequences or procedures. The Owner’s review shall not relieve the Contractor of any obligations.

**ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS**

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101®–2017, SCOSE Version Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101®–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201®–2017, SCOSE Version General Conditions of the Contract for Construction
- .4 Form SE-390, Notice to Proceed – Construction Contract
- .5 Drawings

Number	Title	Date
	See Index of Drawings on Cover	
	Sheet of Drawing Set	

- .6 Specifications

Section	Title	Date	Pages
	See Table of Contents in Project Manual		

- .7 Addenda, if any:

Number	Date	Pages
--------	------	-------

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

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

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

The Sustainability Plan:

Title	Date	Pages
-------	------	-------

Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

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

**Form SE-310, Invitation for Construction Services**  
**Instructions to Bidders (AIA Document A701-2018 OSE Version)**  
**Form SE-330, Contractor’s Bid (Completed Bid Form)**  
**Form SE-370, Notice of Intent to Award**  
**Certificate of Procurement Authority issued by the State Fiscal Accountability Authority**

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

\_\_\_\_\_  
**OWNER** *(Signature)*

\_\_\_\_\_  
**CONTRACTOR** *(Signature)*

\_\_\_\_\_  
*(Printed name and title)*

\_\_\_\_\_  
*(Printed name and title)*

Init.

/

# South Carolina Division of Procurement Services, Office of State Engineer Version of AIA® Document A101® – 2017 Exhibit A

## Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the \_\_\_\_\_ day of \_\_\_\_\_ in the year \_\_\_\_\_  
*(In words, indicate day, month and year.)*

for the following **PROJECT**:  
*(Name, State Project Number, and location or address)*

HGTC - Diesel Engine Training Facility Interior Renovation  
H59-N135-MJ A  
470 Allied Drive, Conway SC 29526

**THE OWNER:**  
*(Name, legal status and address)*

Horry Georgetown Technical College  
2050 Highway 501 East  
Conway, SC 29526

The Owner is a Governmental Body of the State of South Carolina as defined by Title 11, Chapter 35 of the South Carolina Code of Laws, as amended.

**THE CONTRACTOR:**  
*(Name, legal status and address)*

This version of AIA Document A101–2017 Exhibit A is modified by the South Carolina Division of Procurement, Office of State Engineer. Publication of this version of AIA Document A101 Exhibit A does not imply the American Institute of Architects' endorsement of any modification by the South Carolina Division of Procurement, Office of State Engineer.

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

## TABLE OF ARTICLES

- A.1 GENERAL
- A.2 OWNER'S INSURANCE
- A.3 CONTRACTOR'S INSURANCE AND BONDS
- A.4 SPECIAL TERMS AND CONDITIONS

### ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201®–2017, General Conditions of the Contract for Construction, SCOSE Version.

Init.



**ARTICLE A.2 OWNER'S INSURANCE**

**§ A.2.1 General**

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

**§ A.2.2 Liability Insurance**

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

**§ A.2.3 Reserved**

**§ A.2.3.1 Reserved**

**§ A.2.3.1.1 Reserved**

**§ A.2.3.1.2 Reserved**

**§ A.2.3.1.3 Reserved**

**§ A.2.3.1.4 Reserved**

**§ A.2.3.2 Reserved**

**§ A.2.3.3 Reserved**

**§ A.2.4 Optional Insurance.**

The Owner shall purchase and maintain any insurance selected below.

**§ A.2.4.1 Other Insurance**

*(List below any other insurance coverage to be provided by the Owner and any applicable limits.)*

**Coverage**

**Limits**

**ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS**

**§ A.3.1 General**

**§ A.3.1.1 Certificates of Insurance.** The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

**§ A.3.1.2 Deductibles and Self-Insured Retentions.** The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

**§ A.3.1.3 Additional Insured Obligations.** To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the

Init.

Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

**§ A.3.1.4** A failure by the Owner to either (i) demand a certificate of insurance or written endorsement required by Section A.3, or (ii) reject a certificate or endorsement on the grounds that it fails to comply with Section A.3, shall not be considered a waiver of Contractor's obligations to obtain the required insurance.

### **§ A.3.2 Contractor's Required Insurance Coverage**

**§ A.3.2.1** The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, for such other period for maintenance of completed operations coverage as specified in the Contract Documents, or unless a different duration is stated below:

*(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)*

### **§ A.3.2.2 Commercial General Liability**

**§ A.3.2.2.1** Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than \$1,000,000 each occurrence, \$1,000,000 general aggregate, \$1,000,000 aggregate for products-completed operations hazard, \$1,000,000 personal and advertising injury, \$50,000 fire damage (any one fire), and \$5,000 medical expense (any one person) providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

**§ A.3.2.2.2** The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than \$1,000,000 per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability, Employers Liability, and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers. The umbrella policy limits shall not be less than \$3,000,000.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than \$100,000 each accident, \$100,000 each employee, and \$500,000 policy limit for claims, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks.

§ A.3.2.8 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than (\$ ) per claim and (\$ ) in the aggregate.

§ A.3.2.9 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than (\$ ) per claim and (\$ ) in the aggregate.

### § A.3.3 Required Property Insurance

§ A.3.3.1 The Contractor shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Contractor's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.3.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds.

§ A.3.3.1.1 **Causes of Loss.** The insurance required by this Section A.3.3.1 shall provide coverage for direct physical loss or damage and shall include the risks of fire (with extended coverage), explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, workmanship, or materials. (Indicate below the cause of loss and any applicable sub-limit.)

**Causes of Loss**

**Sub-Limit**

§ A.3.3.1.2 **Specific Required Coverages.** The insurance required by this Section A.3.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. (Indicate below the cause of loss and any applicable sub-limit.)

Init.

**§ A.3.3.1.3** Unless the parties agree otherwise, upon Substantial Completion, the Owner shall replace the insurance policy required under Section A.3.3.1 with property insurance written for the total value of the Project.

**§ A.3.3.1.4 Deductibles and Self-Insured Retentions.** If the insurance required by this Section A.3.3 is subject to deductibles or self-insured retentions, the Contractor shall be responsible for all loss not covered because of such deductibles or retentions.

**§ A.3.3.2 Occupancy or Use Prior to Substantial Completion.** The Owner’s occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.3.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

**§ A.3.3.3** If the Owner requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

**§ A.3.3.4** Before an exposure to loss may occur, the Contractor shall file with the Owner a copy of each policy that includes insurance coverages required by this Section A.3.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project.

**§ A.3.4 Contractor’s Other Insurance Coverage**

**§ A.3.4.1** Insurance selected and described in this Section A.3.4 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

*(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)*

**§ A.3.4.2** The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.4.1.

*(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)*

**§ A.3.4.2.1 Reserved**

**§ A.3.4.2.2** Insurance for physical damage to property while it is in storage and in transit to the construction site on an “all-risks” completed value form.

**§ A.3.4.2.3** Property insurance on an “all-risks” completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

**§ A.3.4.2.4 Boiler and Machinery Insurance**  
The Contractor shall purchase and maintain boiler and machinery insurance as required, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this

insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

**§ A.3.5 Performance Bond and Payment Bond**

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

*(Specify type and penal sum of bonds.)*

Type	Penal Sum (\$0.00)
Payment Bond	
Performance Bond	

**§ A.3.5.1** Before commencing any services hereunder, the Contractor shall provide the Owner with Performance and Payment Bonds, each in an amount not less than the Contract Price set forth in Article 4 of the Agreement. The Surety shall have, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty". In addition, the Surety shall have a minimum "Best Financial Strength Category" of "Class V", and in no case less than five (5) times the contract amount. The Performance Bond shall be written on Form SE-355, "Performance Bond" and the Payment Bond shall be written on Form SE-357, "Labor and Material Payment Bond", and both shall be made payable to the Owner.

**§ A.3.5.2** The Performance and Labor and Material Payment Bonds shall:

- .1 be issued by a surety company licensed to do business in South Carolina;
- .2 be accompanied by a current power of attorney and certified by the attorney-in-fact who executes the bond on the behalf of the surety company; and
- .3 remain in effect for a period not less than one (1) year following the date of Substantial Completion or the time required to resolve any items of incomplete Work and the payment of any disputed amounts, whichever time period is longer.

**§ A.3.5.3** Any bonds required by this Contract shall meet the requirements of the South Carolina Code of Laws and Regulations, as amended.

**ARTICLE A.4 SPECIAL TERMS AND CONDITIONS**

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:



# AIA Document A201® – 2017

## General Conditions of the Contract for Construction

### for the following PROJECT:

*(Name and location or address)*

HGTC - Diesel Engine Training Facility Interior Renovation - H59-N134-MJ  
470 Allied Drive, Conway, SC 29526

### THE OWNER:

*(Name, legal status and address)*

Horry-Georgetown Technical College  
2050 Highway 501 East  
Conway, SC 29526

### THE ARCHITECT:

*(Name, legal status and address)*

Quackenbush Architects + Planners, LLC  
1217 Hampton Street  
Columbia, SC 29201

This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its completion or modification.

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

### TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 OWNER
- 3 CONTRACTOR
- 4 ARCHITECT
- 5 SUBCONTRACTORS
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
- 7 CHANGES IN THE WORK
- 8 TIME
- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 INSURANCE AND BONDS
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

Init.

## INDEX

(Topics and numbers in bold are Section headings.)

### Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3

### Access to Work

**3.16**, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,

10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

### Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

### Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

### Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

### Allowances

**3.8**

### Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,

3.12.10.1, 4.2.7, 9.3.2, 13.4.1

### Arbitration

8.3.1, 15.3.2, **15.4**

## ARCHITECT

**4**

Architect, Definition of

**4.1.1**

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,  
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,  
13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and  
Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,  
4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4,  
9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,  
7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,  
13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,  
3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,  
3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,  
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

### Award of Subcontracts and Other Contracts for Portions of the Work

**5.2**

### Basic Definitions

**1.1**

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,  
15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

### Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

### Building Information Models Use and Reliance

**1.8**

Building Permit

3.7.1

### Capitalization

**1.3**

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

## **Certificates for Payment**

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval  
13.4.4

Certificates of Insurance  
9.10.2

## **Change Orders**

1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2

**Change Orders**, Definition of  
**7.2.1**

## **CHANGES IN THE WORK**

2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5

**Claims**, Definition of

### **15.1.1**

Claims, Notice of  
1.6.2, 15.1.3

## **CLAIMS AND DISPUTES**

3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4  
Claims and Timely Assertion of Claims  
15.4.1

### **Claims for Additional Cost**

3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**

### **Claims for Additional Time**

3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**

### **Concealed or Unknown Conditions, Claims for** **3.7.4**

Claims for Damages  
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7

Claims Subject to Arbitration  
15.4.1

## **Cleaning Up**

**3.15**, 6.3

Commencement of the Work, Conditions Relating to  
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**

**Commencement of the Work**, Definition of  
**8.1.2**

## **Communications**

3.9.1, **4.2.4**

Completion, Conditions Relating to  
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2

## **COMPLETION, PAYMENTS AND** **9**

Completion, Substantial  
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2

Compliance with Laws  
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions  
3.7.4, 4.2.8, 8.3.1, 10.3

## Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2

## **Consolidation or Joinder**

### **15.4.4**

## **CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

1.1.4, **6**

**Construction Change Directive**, Definition of  
**7.3.1**

### **Construction Change Directives**

1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1

Construction Schedules, Contractor's

3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

### **Contingent Assignment of Subcontracts**

**5.4**, 14.2.2.2

## **Continuing Contract Performance**

### **15.1.4**

**Contract**, Definition of

### **1.1.2**

## **CONTRACT, TERMINATION OR SUSPENSION OF THE**

5.4.1.1, 5.4.2, 11.5, **14**

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to  
3.7.1, 3.10, 5.2, 6.1

Contract Documents, Copies Furnished and Use of  
1.5.2, 2.3.6, 5.3

**Contract Documents**, Definition of

### **1.1.1**

### **Contract Sum**

2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**

**Contract Sum**, Definition of

### **9.1**

Contract Time

1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5

**Contract Time**, Definition of

### **8.1.1**

## **CONTRACTOR**

### **3**

Contractor, Definition of

### **3.1**, **6.1.2**

## **Contractor's Construction and Submittal Schedules**

**3.10**, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2

Contractor's Employees

2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1



## **Contractor's Liability Insurance**

### **11.1**

Contractor's Relationship with Separate Contractors and Owner's Forces

3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4

Contractor's Relationship with Subcontractors

1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4

Contractor's Relationship with the Architect

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1

Contractor's Representations

3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the Work

3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents

3.2

Contractor's Right to Stop the Work

2.2.2, 9.7

Contractor's Right to Terminate the Contract

14.1

Contractor's Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3

Contractor's Superintendent

3.9, 10.2.6

Contractor's Supervision and Construction

Procedures

1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4

Coordination and Correlation

1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications

1.5, 2.3.6, 3.11

Copyrights

1.5, **3.17**

Correction of Work

2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1

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

**Cost**, Definition of

**7.3.4**

Costs

2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14

**Cutting and Patching**

**3.14**, 6.2.5

Damage to Construction of Owner or Separate Contractors

3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damage to the Work

3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damages, Claims for

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7

Damages for Delay

6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2

**Date of Commencement of the Work**, Definition of  
**8.1.2**

**Date of Substantial Completion**, Definition of  
**8.1.3**

**Day**, Definition of

**8.1.4**

Decisions of the Architect

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2

**Decisions to Withhold Certification**

9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance, Rejection and Correction of

2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Definitions

1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1

**Delays and Extensions of Time**

**3.2**, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5

**Digital Data Use and Transmission**

**1.7**

Disputes

6.3, 7.3.9, 15.1, 15.2

**Documents and Samples at the Site**

**3.11**

**Drawings**, Definition of

**1.1.5**

Drawings and Specifications, Use and Ownership of

3.11

Effective Date of Insurance

8.2.2

**Emergencies**

**10.4**, 14.1.1.2, **15.1.5**

Employees, Contractor's

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1

Equipment, Labor, or Materials

1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work

1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**

**Failure of Payment**

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Faulty Work  
(See Defective or Nonconforming Work)  
**Final Completion and Final Payment**  
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3  
Financial Arrangements, Owner's  
2.2.1, 13.2.2, 14.1.1.4

## **GENERAL PROVISIONS**

### **1**

#### **Governing Law**

##### **13.1**

Guarantees (See Warranty)

#### **Hazardous Materials and Substances**

##### 10.2.4, **10.3**

Identification of Subcontractors and Suppliers  
5.2.1

#### **Indemnification**

3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3

#### **Information and Services Required of the Owner**

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,  
9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,  
14.1.1.4, 14.1.4, 15.1.4

#### **Initial Decision**

##### **15.2**

#### **Initial Decision Maker, Definition of**

1.1.8

Initial Decision Maker, Decisions

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Initial Decision Maker, Extent of Authority

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

#### **Injury or Damage to Person or Property**

##### **10.2.8**, 10.4

Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,  
9.9.2, 9.10.1, 12.2.1, 13.4

Instructions to Bidders

1.1.1

Instructions to the Contractor

3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

#### **Instruments of Service, Definition of**

##### **1.1.7**

Insurance

6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,

##### **11**

Insurance, Notice of Cancellation or Expiration

11.1.4, 11.2.3

#### **Insurance, Contractor's Liability**

##### **11.1**

Insurance, Effective Date of  
8.2.2, 14.4.2

#### **Insurance, Owner's Liability**

##### **11.2**

#### **Insurance, Property**

**10.2.5**, 11.2, 11.4, 11.5

Insurance, Stored Materials

9.3.2

## **INSURANCE AND BONDS**

### **11**

Insurance Companies, Consent to Partial Occupancy  
9.9.1

Insured loss, Adjustment and Settlement of  
11.5

Intent of the Contract Documents

1.2.1, 4.2.7, 4.2.12, 4.2.13

## **Interest**

### **13.5**

#### **Interpretation**

1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1

Interpretations, Written

4.2.11, 4.2.12

Judgment on Final Award

15.4.2

#### **Labor and Materials, Equipment**

1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,  
5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,  
10.2.4, 14.2.1.1, 14.2.1.2

Labor Disputes

8.3.1

Laws and Regulations

1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,  
9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8,  
15.4

Liens

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Limitations, Statutes of

12.2.5, 15.1.2, 15.4.1.1

Limitations of Liability

3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,  
4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,  
11.3, 12.2.5, 13.3.1

Limitations of Time

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,  
5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,  
9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,  
15.1.2, 15.1.3, 15.1.5

#### **Materials, Hazardous**

##### **10.2.4**, **10.3**

Materials, Labor, Equipment and

1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,  
5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,  
10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and  
Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

#### **Mediation**

8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1,  
15.4.1.1

#### **Minor Changes in the Work**

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

## **MISCELLANEOUS PROVISIONS**

### **13**

#### **Modifications, Definition of**

##### **1.1.1**

Modifications to the Contract  
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,  
10.3.2

## **Mutual Responsibility**

### **6.2**

#### **Nonconforming Work, Acceptance of**

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of  
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,  
12.2

#### **Notice**

**1.6**, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4,  
3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4,  
8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1,  
13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5,  
15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance  
11.1.4, 11.2.3

#### **Notice of Claims**

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5,  
15.1.6, 15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections  
13.4.1, 13.4.2

Observations, Contractor's  
3.2, 3.7.4

Occupancy  
2.3.1, 9.6.6, 9.8

Orders, Written  
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2,  
14.3.1

## **OWNER**

### **2**

**Owner**, Definition of

#### **2.1.1**

#### **Owner, Evidence of Financial Arrangements**

**2.2**, 13.2.2, 14.1.1.4

#### **Owner, Information and Services Required of the**

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5,  
9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1,  
13.4.2, 14.1.1.4, 14.1.4, 15.1.4

Owner's Authority

1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2,  
4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1,  
7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2,  
10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4,  
15.2.7

#### **Owner's Insurance**

### **11.2**

Owner's Relationship with Subcontractors

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

#### **Owner's Right to Carry Out the Work**

**2.5**, 14.2.2

#### **Owner's Right to Clean Up**

### **6.3**

#### **Owner's Right to Perform Construction and to Award Separate Contracts**

### **6.1**

#### **Owner's Right to Stop the Work**

### **2.4**

Owner's Right to Suspend the Work  
14.3

Owner's Right to Terminate the Contract  
14.2, 14.4

#### **Ownership and Use of Drawings, Specifications and Other Instruments of Service**

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12,  
5.3

#### **Partial Occupancy or Use**

9.6.6, **9.9**

#### **Patching, Cutting and**

**3.14**, 6.2.5

Patents

3.17

#### **Payment, Applications for**

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,  
14.2.3, 14.2.4, 14.4.3

#### **Payment, Certificates for**

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,  
9.10.3, 14.1.1.3, 14.2.4

#### **Payment, Failure of**

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Payment, Final

4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3

#### **Payment Bond, Performance Bond and**

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

#### **Payments, Progress**

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

## **PAYMENTS AND COMPLETION**

### **9**

Payments to Subcontractors

5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB

10.3.1

#### **Performance Bond and Payment Bond**

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

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

2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2

## **PERSONS AND PROPERTY, PROTECTION OF**

### **10**

Polychlorinated Biphenyl

10.3.1

**Product Data**, Definition of

### **3.12.2**

#### **Product Data and Samples, Shop Drawings**

3.11, **3.12**, 4.2.7

#### **Progress and Completion**

4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4

#### **Progress Payments**

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

**Project**, Definition of

### **1.1.4**

Project Representatives

4.2.10

## **Property Insurance**

10.2.5, **11.2**

Proposal Requirements

1.1.1

## **PROTECTION OF PERSONS AND PROPERTY** **10**

Regulations and Laws

1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

Rejection of Work

4.2.6, 12.2.1

Releases and Waivers of Liens

9.3.1, 9.10.2

Representations

3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1

Representatives

2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1

Responsibility for Those Performing the Work

3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10

Retainage

9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

**Review of Contract Documents and Field**

**Conditions by Contractor**

**3.2**, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and Architect

3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and Samples by Contractor

3.12

**Rights and Remedies**

1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4

**Royalties, Patents and Copyrights**

**3.17**

Rules and Notices for Arbitration

15.4.1

**Safety of Persons and Property**

**10.2**, 10.4

**Safety Precautions and Programs**

3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4

**Samples**, Definition of

**3.12.3**

**Samples, Shop Drawings, Product Data and**

3.11, **3.12**, 4.2.7

**Samples at the Site, Documents and**

**3.11**

**Schedule of Values**

**9.2**, 9.3.1

Schedules, Construction

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

Separate Contracts and Contractors

1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2

**Separate Contractors**, Definition of

**6.1.1**

**Shop Drawings**, Definition of

**3.12.1**

**Shop Drawings, Product Data and Samples**

3.11, **3.12**, 4.2.7

**Site**, Use of

**3.13**, 6.1.1, 6.2.1

Site Inspections

3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4

Site Visits, Architect's

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Special Inspections and Testing

4.2.6, 12.2.1, 13.4

**Specifications**, Definition of

**1.1.6**

**Specifications**

1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14

Statute of Limitations

15.1.2, 15.4.1.1

Stopping the Work

2.2.2, 2.4, 9.7, 10.3, 14.1

Stored Materials

6.2.1, 9.3.2, 10.2.1.2, 10.2.4

**Subcontractor**, Definition of

**5.1.1**

**SUBCONTRACTORS**

**5**

Subcontractors, Work by

1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7

**Subcontractual Relations**

**5.3**, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1

Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3

Submittal Schedule

3.10.2, 3.12.5, 4.2.7

**Subrogation, Waivers of**

6.1.1, **11.3**

**Substances, Hazardous**

**10.3**

**Substantial Completion**

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2

**Substantial Completion**, Definition of

**9.8.1**

Substitution of Subcontractors

5.2.3, 5.2.4

Substitution of Architect

2.3.3

Substitutions of Materials

3.4.2, 3.5, 7.3.8

**Sub-subcontractor**, Definition of

**5.1.2**

Subsurface Conditions

3.7.4

**Successors and Assigns**

**13.2**

## **Superintendent**

3.9, 10.2.6

## **Supervision and Construction Procedures**

1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4

## **Suppliers**

1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1

## **Surety**

5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7

## **Surety, Consent of**

9.8.5, 9.10.2, 9.10.3

## **Surveys**

1.1.7, 2.3.4

## **Suspension by the Owner for Convenience**

14.3

## **Suspension of the Work**

3.7.5, 5.4.2, 14.3

## **Suspension or Termination of the Contract**

5.4.1.1, 14

## **Taxes**

3.6, 3.8.2.1, 7.3.4.4

## **Termination by the Contractor**

14.1, 15.1.7

## **Termination by the Owner for Cause**

5.4.1.1, 14.2, 15.1.7

## **Termination by the Owner for Convenience**

14.4

## **Termination of the Architect**

2.3.3

## **Termination of the Contractor Employment**

14.2.2

## **TERMINATION OR SUSPENSION OF THE CONTRACT**

14

## **Tests and Inspections**

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, 13.4

## **TIME**

8

## **Time, Delays and Extensions of**

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

## **Time Limits**

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4

## **Time Limits on Claims**

3.7.4, 10.2.8, 15.1.2, 15.1.3

## **Title to Work**

9.3.2, 9.3.3

## **UNCOVERING AND CORRECTION OF WORK**

12

## **Uncovering of Work**

12.1

## **Unforeseen Conditions, Concealed or Unknown**

3.7.4, 8.3.1, 10.3

## **Unit Prices**

7.3.3.2, 9.1.2

## **Use of Documents**

1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

## **Use of Site**

3.13, 6.1.1, 6.2.1

## **Values, Schedule of**

9.2, 9.3.1

## **Waiver of Claims by the Architect**

13.3.2

## **Waiver of Claims by the Contractor**

9.10.5, 13.3.2, 15.1.7

## **Waiver of Claims by the Owner**

9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, 15.1.7

## **Waiver of Consequential Damages**

14.2.4, 15.1.7

## **Waiver of Liens**

9.3, 9.10.2, 9.10.4

## **Waivers of Subrogation**

6.1.1, 11.3

## **Warranty**

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2

## **Weather Delays**

8.3, 15.1.6.2

## **Work, Definition of**

1.1.3

## **Written Consent**

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2

## **Written Interpretations**

4.2.11, 4.2.12

## **Written Orders**

1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

## **ARTICLE 1 GENERAL PROVISIONS**

### **§ 1.1 Basic Definitions**

#### **§ 1.1.1 The Contract Documents**

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

#### **§ 1.1.2 The Contract**

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

#### **§ 1.1.3 The Work**

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

#### **§ 1.1.4 The Project**

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

#### **§ 1.1.5 The Drawings**

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

#### **§ 1.1.6 The Specifications**

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

#### **§ 1.1.7 Instruments of Service**

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

#### **§ 1.1.8 Initial Decision Maker**

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

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

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

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

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

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

### **§ 1.3 Capitalization**

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

### **§ 1.4 Interpretation**

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

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

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

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

### **§ 1.6 Notice**

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

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

### **§ 1.7 Digital Data Use and Transmission**

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

### **§ 1.8 Building Information Models Use and Reliance**

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

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

## **ARTICLE 2 OWNER**

### **§ 2.1 General**

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

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

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

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

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

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

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

### **§ 2.3 Information and Services Required of the Owner**

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

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

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



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

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

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

#### **§ 2.4 Owner's Right to Stop the Work**

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

#### **§ 2.5 Owner's Right to Carry Out the Work**

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

### **ARTICLE 3 CONTRACTOR**

#### **§ 3.1 General**

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

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

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

#### **§ 3.2 Review of Contract Documents and Field Conditions by Contractor**

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

**§ 3.2.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in

such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

### **§ 3.3 Supervision and Construction Procedures**

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

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

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

### **§ 3.4 Labor and Materials**

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

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

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

### **§ 3.5 Warranty**

**§ 3.5.1** The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or

equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

### **§ 3.6 Taxes**

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

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

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

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

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

### **§ 3.7.4 Concealed or Unknown Conditions**

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

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

### **§ 3.8 Allowances**

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

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

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

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

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

### **§ 3.9 Superintendent**

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

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

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

### **§ 3.10 Contractor's Construction and Submittal Schedules**

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

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

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

### **§ 3.11 Documents and Samples at the Site**

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

### **§ 3.12 Shop Drawings, Product Data and Samples**

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

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

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

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

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

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

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

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

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

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

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

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

### **§ 3.13 Use of Site**

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

### **§ 3.14 Cutting and Patching**

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

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

### **§ 3.15 Cleaning Up**

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

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

### **§ 3.16 Access to Work**

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

### **§ 3.17 Royalties, Patents and Copyrights**

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

### **§ 3.18 Indemnification**

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

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

compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

## **ARTICLE 4 ARCHITECT**

### **§ 4.1 General**

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

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

### **§ 4.2 Administration of the Contract**

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

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

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

### **§ 4.2.4 Communications**

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

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

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

**§ 4.2.7** The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of

other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

## **ARTICLE 5 SUBCONTRACTORS**

### **§ 5.1 Definitions**

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

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

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

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



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

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

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

### **§ 5.3 Subcontractual Relations**

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

### **§ 5.4 Contingent Assignment of Subcontracts**

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

## **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

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

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

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

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

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

## **§ 6.2 Mutual Responsibility**

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

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

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

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

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

## **§ 6.3 Owner’s Right to Clean Up**

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

## **ARTICLE 7 CHANGES IN THE WORK**

### **§ 7.1 General**

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

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

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

## **§ 7.2 Change Orders**

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

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

## **§ 7.3 Construction Change Directives**

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

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

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

#### **§ 7.4 Minor Changes in the Work**

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

### **ARTICLE 8 TIME**

#### **§ 8.1 Definitions**

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

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

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

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

#### **§ 8.2 Progress and Completion**

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

**§ 8.2.2** The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

#### **§ 8.3 Delays and Extensions of Time**

**§ 8.3.1** If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 Contract Sum**

**§ 9.1.1** The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

**§ 9.1.2** If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

### **§ 9.2 Schedule of Values**

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

### **§ 9.3 Applications for Payment**

**§ 9.3.1** At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

**§ 9.3.1.1** As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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

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

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

### **§ 9.4 Certificates for Payment**

**§ 9.4.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or

(3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

### **§ 9.5 Decisions to Withhold Certification**

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

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

**§ 9.5.2** When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

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

### **§ 9.6 Progress Payments**

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

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

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

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

**§ 9.6.5** The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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

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

**§ 9.6.8** Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

### **§ 9.7 Failure of Payment**

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

### **§ 9.8 Substantial Completion**

**§ 9.8.1** Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

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

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

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

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

### **§ 9.9 Partial Occupancy or Use**

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

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

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

### **§ 9.10 Final Completion and Final Payment**

**§ 9.10.1** Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

**§ 9.10.2** Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.



**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

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

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

**§ 9.10.5** Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

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

### **§ 10.1 Safety Precautions and Programs**

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

### **§ 10.2 Safety of Persons and Property**

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

**§ 10.2.2** The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

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

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

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

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

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

**§ 10.2.8 Injury or Damage to Person or Property**

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

**§ 10.3 Hazardous Materials and Substances**

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

**§ 10.3.2** Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

**§ 10.3.3** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

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

**§ 10.3.5** The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

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

## § 10.4 Emergencies

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

## ARTICLE 11 INSURANCE AND BONDS

### § 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

### § 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by

an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

### **§ 11.3 Waivers of Subrogation**

**§ 11.3.1** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

**§ 11.3.2** If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

### **§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance**

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

### **§ 11.5 Adjustment and Settlement of Insured Loss**

**§ 11.5.1** A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

**§ 11.5.2** Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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

### **§ 12.1 Uncovering of Work**

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

**§ 12.1.2** If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract

Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

## **§ 12.2 Correction of Work**

### **§ 12.2.1 Before Substantial Completion**

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

### **§ 12.2.2 After Substantial Completion**

**§ 12.2.2.1** In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

**§ 12.2.2.2** The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

**§ 12.2.3** The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

**§ 12.2.4** The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

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

## **§ 12.3 Acceptance of Nonconforming Work**

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

## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **§ 13.1 Governing Law**

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

### **§ 13.2 Successors and Assigns**

**§ 13.2.1** The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in

Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

### **§ 13.3 Rights and Remedies**

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

**§ 13.3.2** No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

### **§ 13.4 Tests and Inspections**

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

**§ 13.4.2** If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

**§ 13.4.3** If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

### **§ 13.5 Interest**

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

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

### **§ 14.1 Termination by the Contractor**

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

**§ 14.1.2** The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

**§ 14.1.3** If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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

#### **§ 14.2 Termination by the Owner for Cause**

**§ 14.2.1** The Owner may terminate the Contract if the Contractor

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

**§ 14.2.2** When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

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

#### **§ 14.3 Suspension by the Owner for Convenience**

**§ 14.3.1** The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

**§ 14.3.2** The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

#### **§ 14.4 Termination by the Owner for Convenience**

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

**§ 14.4.2** Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

**§ 14.4.3** In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

### **ARTICLE 15 CLAIMS AND DISPUTES**

#### **§ 15.1 Claims**

##### **§ 15.1.1 Definition**

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

##### **§ 15.1.2 Time Limits on Claims**

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

##### **§ 15.1.3 Notice of Claims**

**§ 15.1.3.1** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

**§ 15.1.3.2** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

##### **§ 15.1.4 Continuing Contract Performance**

**§ 15.1.4.1** Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

**§ 15.1.4.2** The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.



### **§ 15.1.5 Claims for Additional Cost**

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

### **§ 15.1.6 Claims for Additional Time**

**§ 15.1.6.1** If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

**§ 15.1.6.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

### **§ 15.1.7 Waiver of Claims for Consequential Damages**

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

### **§ 15.2 Initial Decision**

**§ 15.2.1** Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

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

**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

**§ 15.2.7** In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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

### **§ 15.3 Mediation**

**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

**§ 15.3.3** Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

### **§ 15.4 Arbitration**

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

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

for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

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

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

**§ 15.4.4 Consolidation or Joinder**

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

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

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

# SE-355 PERFORMANCE BOND

**KNOW ALL MEN BY THESE PRESENTS**, that *(Insert full name or legal title and address of Contractor)*

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

hereinafter referred to as “Contractor”, and *(Insert full name and address of principal place of business of Surety)*

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

hereinafter called the “surety”, are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: Horry Georgetown Technical College  
Address: 2050 US-501  
Conway, SC 29526

hereinafter referred to as “Agency”, or its successors or assigns, the sum of \_\_\_\_\_ (\$ \_\_\_\_\_), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, Contractor has by written agreement dated \_\_\_\_\_ entered into a contract with Agency to construct

State Project Name: HGTC - Diesel Engine Traning Facility Inteior Renovation

State Project Number: H59-N134-MJ

Brief Description of Awarded Work: Renovation of an 13,500SF existing pre-engineered metal building to include a large open lab, 2 classrooms, restrooms, and support spaces. Work consists of metal stud walls, hollow metal doors and frames, acoustical panel ceilings, and all new HVAC, lighting, and electrical systems, and other Work indicated in the Contract Documents.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Quackenbush Architects + Planners  
Address: 1217 Hampton St.  
Columbia, SC 29201

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

**IN WITNESS WHEREOF**, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

**DATED this** \_\_\_\_\_ **day of** \_\_\_\_\_, **2** \_\_\_\_\_  
*(shall be no earlier than Date of Contract)*

**BOND NUMBER** \_\_\_\_\_

**CONTRACTOR**

**SURETY**

By: \_\_\_\_\_  
(Seal)

By: \_\_\_\_\_  
(Seal)

Print Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

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

Print Title: \_\_\_\_\_  
*(Attach Power of Attorney)*

Witness: \_\_\_\_\_

Witness: \_\_\_\_\_

*(Additional Signatures, if any, appear on attached page)*

**SE-355****PERFORMANCE BOND****NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:**

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency for the full and faithful performance of the contract, which is incorporated herein by reference.
2. If the Contractor performs the contract, the Surety and the Contractor have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.
3. The Surety's obligation under this Bond shall arise after:
  - 3.1 The Agency has notified the Contractor and the Surety at the address described in paragraph 10 below, that the Agency is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If the Agency, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the Agency's right, if any, subsequently to declare a Contractor Default; or
  - 3.2 The Agency has declared a Contractor Default and formally terminated the Contractor's right to complete the Contract.
4. The Surety shall, within 15 days after receipt of notice of the Agency's declaration of a Contractor Default, and at the Surety's sole expense, take one of the following actions:
  - 4.1 Arrange for the Contractor, with consent of the Agency, to perform and complete the Contract; or
  - 4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
  - 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Agency for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Agency and the contractor selected with the Agency's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the Agency the amount of damages as described in paragraph 7 in excess of the Balance of the Contract Sum incurred by the Agency resulting from the Contractor Default; or
  - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and:
    - 4.4.1 After investigation, determine the amount for which it may be liable to the Agency and, within 60 days of waiving its rights under this paragraph, tender payment thereof to the Agency; or
    - 4.4.2 Deny liability in whole or in part and notify the Agency, citing the reasons therefore.
5. Provided Surety has proceeded under paragraphs 4.1, 4.2, or 4.3, the Agency shall pay the Balance of the Contract Sum to either:
  - 5.1 Surety in accordance with the terms of the Contract; or
  - 5.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.
  - 5.3 The balance of the Contract Sum due either the Surety or another contractor shall be reduced by the amount of damages as described in paragraph 7.
6. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond 15 days after receipt of written notice from the Agency to the Surety demanding that the Surety perform its obligations under this Bond, and the Agency shall be entitled to enforce any remedy available to the Agency.
  - 6.1 If the Surety proceeds as provided in paragraph 4.4 and the Agency refuses the payment tendered or the Surety has denied liability, in whole or in part, then without further notice the Agency shall be entitled to enforce any remedy available to the Agency.
  - 6.2 Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the Dispute Resolution process defined in the Contract Documents and the laws of the State of South Carolina.
7. After the Agency has terminated the Contractor's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Agency shall be those of the Contractor under the Contract, and the responsibilities of the Agency to the Surety shall those of the Agency under the Contract. To a limit of the amount of this Bond, but subject to commitment by the Agency of the Balance of the Contract Sum to mitigation of costs and damages on the Contract, the Surety is obligated to the Agency without duplication for:
  - 7.1 The responsibilities of the Contractor for correction of defective Work and completion of the Contract; and
  - 7.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and
  - 7.3 Damages awarded pursuant to the Dispute Resolution Provisions of the Contract. Surety may join in any Dispute Resolution proceeding brought under the Contract and shall be bound by the results thereof; and
  - 7.4 Liquidated Damages, or if no Liquidated Damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. The Surety shall not be liable to the Agency or others for obligations of the Contractor that are unrelated to the Contract, and the Balance of the Contract Sum shall not be reduced or set-off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Agency or its heirs, executors, administrators, or successors.
9. The Surety hereby waives notice of any change, including changes of time, to the contract or to related subcontracts, purchase orders and other obligations.
10. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the address shown on the signature page.
11. Definitions
  - 11.1 Balance of the Contract Sum: The total amount payable by the Agency to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts to be received by the Agency in settlement of insurance or other Claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.
  - 11.2 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform the Contract or otherwise to comply with the terms of the Contract.

**SE-357**  
**LABOR & MATERIAL PAYMENT BOND**

**KNOW ALL MEN BY THESE PRESENTS**, that *(Insert full name or legal title and address of Contractor)*

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

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

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

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: Horry Georgetown Technical College  
Address: 2050 US-501  
Conway, SC 29526

hereinafter referred to as "Agency", or its successors or assigns, the sum of \_\_\_\_\_ (\$ \_\_\_\_\_), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, Contractor has by written agreement dated \_\_\_\_\_ entered into a contract with Agency to construct

State Project Name: HGTC - Diesel Engine Training Facility Interior Renovation  
State Project Number: H59-N134-MJ

Brief Description of Awarded Work: Renovation of an 13,500SF existing pre-engineered metal building to include a large open lab, 2 classrooms, restrooms, and support spaces. Work consists of metal stud walls, hollow metal doors and frames, acoustical panel ceilings, and all new HVAC, lighting, and electrical systems, and other Work indicated in the Contract Documents.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Quackenbush Architects + Planners  
Address: 1217 Hampton St.  
Columbia, SC 29201

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

**IN WITNESS WHEREOF**, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Labor & Material Payment Bond to be duly executed on its behalf by its authorized officer, agent or representative.

**DATED this** \_\_\_\_\_ **day of** \_\_\_\_\_, **2** \_\_\_\_\_ **BOND NUMBER** \_\_\_\_\_  
*(shall be no earlier than Date of Contract)*

**CONTRACTOR**

**By:** \_\_\_\_\_  
(Seal)

**Print Name:** \_\_\_\_\_

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

**Witness:** \_\_\_\_\_

**SURETY**

**By:** \_\_\_\_\_  
(Seal)

**Print Name:** \_\_\_\_\_

**Print Title:** \_\_\_\_\_  
*(Attach Power of Attorney)*

**Witness:** \_\_\_\_\_

*(Additional Signatures, if any, appear on attached page)*

**SE-357****LABOR & MATERIAL PAYMENT BOND****NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:**

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency to pay for all labor, materials and equipment required for use in the performance of the Contract, which is incorporated herein by reference.
  2. With respect to the Agency, this obligation shall be null and void if the Contractor:
    - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and
    - 2.2 Defends, indemnifies and holds harmless the Agency from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract.
  3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
  4. With respect to Claimants, and subject to the provisions of Title 29, Chapter 5 and the provisions of §11-35-3030(2)(c) of the SC Code of Laws, as amended, the Surety's obligation under this Bond shall arise as follows:
    - 4.1 Every person who has furnished labor, material or rental equipment to the Contractor or its subcontractors for the work specified in the Contract, and who has not been paid in full therefore before the expiration of a period of ninety (90) days after the date on which the last of the labor was done or performed by him or material or rental equipment was furnished or supplied by him for which such claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute such action for the sum or sums justly due him.
    - 4.2 A remote claimant shall have a right of action on the payment bond upon giving written notice by certified or registered mail to the Contractor within ninety (90) days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material or rental equipment upon which such claim is made.
    - 4.3 Every suit instituted upon a payment bond shall be brought in a court of competent jurisdiction for the county or circuit in which the construction contract was to be performed, but no such suit shall be commenced after the expiration of one year after the day on which the last of the labor was performed or material or rental equipment was supplied by the person bringing suit.
  5. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
    - 5.1 Send an answer to the Claimant, with a copy to the Agency, within sixty (60) days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
    - 5.2 Pay or arrange for payment of any undisputed amounts.
    - 5.3 The Surety's failure to discharge its obligations under this paragraph 5 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a claim. However, if the Surety fails to discharge its obligations under this paragraph 5, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs to recover any sums found to be due and owing to the Claimant.
  6. Amounts owed by the Agency to the Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Agency accepting this Bond, they agree that all funds earned by the contractor in the performance of the Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Agency's prior right to use the funds for the completion of the Work.
  7. The Surety shall not be liable to the Agency, Claimants or others for obligations of the Contractor that are unrelated to the Contract. The Agency shall not be liable for payment of any costs or expenses of any claimant under this bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
  8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.
  9. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the Agency or the contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
  10. By the Contractor furnishing and the Agency accepting this Bond, they agree that this Bond has been furnished to comply with the statutory requirements of the South Carolina Code of Laws, as amended, and further, that any provision in this Bond conflicting with said statutory requirements shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.
  11. Upon request of any person or entity appearing to be a potential beneficiary of this bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
  12. Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the laws of the State of South Carolina.
- 13. DEFINITIONS**
- 13.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the Contractor and the Contractor's Subcontractors, and all other items for which a mechanic's lien might otherwise be asserted.
  - 13.2 Remote Claimant: A person having a direct contractual relationship with a subcontractor of the Contractor or subcontractor, but no contractual relationship expressed or implied with the Contractor.
  - 13.3 Contract: The agreement between the Agency and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

SE-380

CHANGE ORDER NO.: \_\_\_\_\_

**CHANGE ORDER TO DESIGN-BID-BUILD CONTRACT**

**AGENCY:** Horry Georgetown Technical College

**PROJECT NAME:** HGTC - Diesel Engine Training Facility Interior Renovation

**PROJECT NUMBER:** H59-N134-MJ

**CONTRACTOR:** \_\_\_\_\_ **CONTRACT DATE:** \_\_\_\_\_

**This Contract is changed as follows:** *(Insert description of change in space provided below)*

**ADJUSTMENTS IN THE CONTRACT SUM:**

1. Original Contract Sum:		\$
2. Change in Contract Sum by previously approved Change Orders:		
3. Contract Sum prior to this Change Order		\$ 0.00
4. Amount of this Change Order:		
5. New Contract Sum, including this Change Order:		\$ 0.00

**ADJUSTMENTS IN THE CONTRACT TIME:**

1. Original Substantial Completion Date:		
2. Sum of previously approved increases and decreases in Days:		Days
3. Change in Days for this Change Order		Days
4. Total Number of Days added to this Contract including this Change Order		0 Days
5. New Substantial Completion Date:		

**CONTRACTOR ACCEPTANCE:**

**BY:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
*(Signature of Representative)*

**Print Name of Representative:** \_\_\_\_\_

**A/E RECOMMENDATION FOR ACCEPTANCE:**

**BY:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
*(Signature of Representative)*

**Print Name or Representative:** \_\_\_\_\_

**AGENCY ACCEPTANCE AND CERTIFICATION:**

I certify that the Agency has authorized, unencumbered funds available for obligation to this contract.

**BY:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
*(Signature of Representative)*

**Print Name of Representative:** \_\_\_\_\_

Change is within Agency Construction Contract Change Order Certification of: \$ \_\_\_\_\_ Yes  No

**APPROVED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
*(OSE Project Manager)*

**SUBMIT THE FOLLOWING TO OSE**

1. SE-380, fully completed and signed by the Contractor, A/E and Agency;
2. Detailed back-up information, with OH&P shown, from the Contractor/Subcontractor(s) that justifies the costs and schedule changes shown.
3. If any item exceeds Agency certification, OSE will approved the SE-380 and return to Agency.



## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFICI) products.
6. Owner-furnished/Owner-installed (OFOI) products.
7. Contractor's use of site and premises.
8. Work restrictions.
9. Specification and Drawing conventions.
10. Miscellaneous provisions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

#### 1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

#### 1.4 PROJECT INFORMATION

- A. Project Identification: HGTC - Diesel Engine Training Facility Interior Renovation / H59-N134-MJ

1. Project Location: 470 Allied Dr., Conway SC 29526.

- B. Owner: Horry Georgetown Technical College.

1. Owner's Representative: Kevin Brown.

- C. Architect: Quackenbush Architects + Planners.
  - 1. Architect's Representative: Barbara Haller.
- D. Other Owner Consultants: Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
  - 1. Mechanical, Electrical, and Plumbing Engineers: Beauford Goff and Associates has prepared the following portions of the Contract Documents:
    - a. Mechanical Engineer: Jonathan Burkett.
    - b. Plumbing Engineer: Mahyar Angooraj
    - c. Electrical Engineer: Brian Melson
- E. Project Coordinator for Multiple Contracts: Owner shall serve as Project coordinator.

#### 1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
  - 1. Renovation of an 13,500SF existing pre-engineered metal building to include a large open lab, 2 classrooms, restrooms, and support spaces. Work consists of metal stud walls, hollow metal doors and frames, acoustical panel ceilings, and all new HVAC, lighting, and electrical systems, and other Work indicated in the Contract Documents..
- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.
- C. Based on the licenses held by the Prime, successful Bidder will be required to provide to the Owner / A-E within 48 hours of Bid a list of the following that are subcontractors:
  - 1. Mechanical – AC
  - 2. Mechanical – PB
  - 3. Mechanical – EL
  - 4. General - BD

#### 1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.
- B. Preceding Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.

1. Demolition Work: Interior demolition scope including interior partitions, ceilings, HVAC, lighting, electrical, and plumbing in the building.

C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.

1. Civil Work:
  - a. Infill of existing loading dock
  - b. Extension of water main to project site.

#### 1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
  - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Air Compressor & Dryer.

#### 1.8 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

A. The Owner will furnish and install products indicated.

B. Owner-Furnished/Owner-Installed (OFOI) Products:

1. Soap Dispensers.
2. Toilet Tissue Dispensers

3. Paper Towel Dispensers
4. Hand Sanitizer Dispensers
5. Monitors

#### 1.9 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

#### 1.10 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

#### 1.11 SPECIFICATION AND DRAWING CONVENTIONS

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
  3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
  4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.
- 1.12 OWNER APPROVAL OF SUBCONTRACTORS AND PERSONNEL
- A. The Contractor shall not employ any subcontractor, superintendent or workmen whose employment on the project is objectionable to the Owner or Architect/Engineer.
- 1.13 MATERIAL DELIVERY, STORAGE AND HANDLING
- A. The Contractor supplying and delivering equipment or materials must provide personnel and equipment to unload these materials at the time they arrive on site, or make provisions for receiving and unloading the shipment for Contractor inventory purposes.
- B. All materials shall be shipped and stored and handled in a manner that will afford protection and insure their being in first-class condition at the time they are incorporated in the work. After installation, they shall be properly protected against damage to ensure their being in first-class condition when the construction is completed and accepted by the Owner.

#### 1.14 EXISTING CONDITIONS

- A. The Contractor, subcontractors and material suppliers shall be responsible for inspecting all job conditions affecting the installation of an item and taking all field measurements required prior to fabrication of an item to ensure that the item concerned will integrate properly with all adjacent materials and fit all other conditions as they exist or will exist in the finished construction. Work in connection with installation of an item shall be coordinated with all other affected work and trades. Sleeves, anchors, and other items that must be embodied in or that otherwise affect other portions of the work will be located and set while such portions of the work are in progress.

#### 1.15 QUALITY OF WORK

- A. All items shall be installed in a workmanlike manner in accordance with the best recognized practice in the field concerned. Manufactured items shall be installed in strict accordance with manufacturer's printed directions, specifications and/or recommendations for installation of highest quality. All working parts shall be properly adjusted after installation and left in perfect working order. Unless otherwise indicated, items exposed to weather or subject to flooding or wetting shall be installed so as to shed and not hold water. Items shall in all cases be installed plumb and true and/or in proper relation to surrounding materials.
- B. All materials entering into the construction of the building covered by this Contract including but not limited to those mentioned below, shall be securely anchored and/or tied together in accordance with the best recognized practice in the field concerned whether shown, specified or not. Ties and anchors shall be best quality for the purpose. All veneers, finishes, and applied items shall be securely anchored and tied to the backing material. The purpose of this paragraph is that each and every piece of otherwise secured in place in a permanent manner that will permit expansion, contraction and other minor movements and normal use of the structure without structural features of the building becoming impaired and without any of its parts becoming loose.
- C. Unless otherwise specifically mentioned, all anchors, bolts, screws, fittings, fillers, hardware, accessories, trim and other parts required for or in connection with an item of material to make a complete, serviceable, finished and first quality installation shall be furnished and installed as part of the item whether or not called for by the Specifications.
- D. Should the Contractor's work require sealant to compete the 'finished product' appearance of any item he is installing, at the direction of the Architect, that Contractor shall furnish and install that sealant whether or not called for on plans or in specifications.
- E. Unless otherwise specifically specified, all items and parts thereof that are made of steel, iron or other ferrous metal that are not galvanized, plated, or otherwise specified to be factory finished, shall be cleaned and painted with one shop coat of the best quality rust inhibitive metallic primer. After installation, all exposed metal connections and abrasions shall be touched up with the same materials as the shop coat and left in good condition for final finishing.

1.16 CONTRACTOR SUPERVISION

- A. The Contractor shall have on-site for the duration of his work a competent representative, capable of the following:
1. Supervision of tradesmen.
  2. Reading and interpreting the Contract Documents.
  3. Orderly coordination of this work with the Architect in the daily execution of the work.
  4. Laying out his work.
  5. Representing the Contractor with the Owner and Architect in the daily execution of the work.
  6. Controlling and establishing good quality in the completed work.
  7. Communicating with all the workers in the Contractor's Employment.
- B. The Contractor's representative shall be the sole supervisor of the Contractor's Labor Force. He shall attend the regularly scheduled progress meetings on-site, keep himself and his company informed of scheduled requirements, safety hazards, and general job conditions. He shall plan and pursue the work under his supervision and expeditious manner.

1.17 INSPECTIONS, TESTING AND SPECIAL INSPECTIONS

- A. The Owner will hire inspectors, testing companies and special inspections. See 014000 for additional information and Contractor's responsibilities.
1. Substantial Completion Inspections: See 017700 "Closeout Procedures" for requirements.

1.18 PERMITS & LICENSES

- A. Notification to DHEC for demolition is also required 10 days prior to demolition.
- B. All contractors and sub-contractors shall be required to obtain necessary business licenses (at no cost to the Owner). The contractor should contact the Business License Office of Horry County directly to find out the Business License fees.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: **Coiling Door.**

1. Base Bid: Existing coiling doors to remain as indicated on Drawing A-101 Floor Plan, A-300 Exterior Elevations, and A-720 Interior Elevations.
2. Alternate: Remove 2 existing coiling doors and install one larger motorized coiling door as indicated on Drawing A-901 Alternates and E-201 First Floor Renovation Plan - Electrical, and as specified in Section 083323 "Overhead Coiling Doors."

END OF SECTION 012300

## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

#### 1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form provided in Project Manual.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

- features and requirements indicated. Indicate deviations, if any, from the Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## 1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.

- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SUBSTITUTION REQUEST FORM

---

**Project** HGTC Diesel Engine Training Facility Interior Renovation  
**Arch. Project No.** 21.286.00

**To** Quackenbush Architects + Planners  
1217 Hampton Street,  
Columbia, South Carolina 29201

**Email:** [bhaller@quackenbusharchitects.com](mailto:bhaller@quackenbusharchitects.com)  
**Attn** Barbara Haller, AIA  
**Phone** 803.771.2999

---

**Requested By** \_\_\_\_\_

**Contract For** \_\_\_\_\_

**Bid Date** \_\_\_\_\_ **Substitution Request Date** \_\_\_\_\_

**Section Name** \_\_\_\_\_

**Section No.** \_\_\_\_\_ **Paragraph** \_\_\_\_\_

**Related Dwgs.** \_\_\_\_\_

---

**Specified Product/Fabrication Method** (List name/description; model no.; manufacturer)

---

Required Information for <i>Specified</i> Product	Attached
Point by Point Comparative Product Data	<input type="checkbox"/>
Test	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
Samples (Where Applicable)	<input type="checkbox"/>

---

**Proposed Product/Fabrication Method** (List trade name/description; model no.; manufacturer)

---

Required Information for <i>Proposed</i> Product	Attached
Point by Point Comparative Product Data	<input type="checkbox"/>
Test	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
Samples (Where Applicable)	<input type="checkbox"/>

---

**Reason for Request**

---

---

---

---

**List of Related Changes/Modifications**

---

---

---

---

**Differences Between Proposed Substitution and Specified Product**

---

---

---

---

**Proposed Product/Fabrication Method Affects Other Parts of the Work**      Yes  No  **Explain:**

---

---

---

---

**Proposed Product/Fabrication Method Affects the Construction Schedule** Yes  No  **Explain:**

---

---

---

---

**Undersigned Pays for Changes to the Building Design, including engineering and detailing costs**

**Caused by the Requested Substitution**      Yes  No  **Explain:**

---

---

---

---

**Attach Additional Sheets if Required**

**CERTIFICATE OF EQUAL PERFORMANCE AND  
ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE**

---

Undersigned certifies:

1. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product, except as noted herein.
2. Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
3. Same special warranty will be furnished for proposed substitution as for specified product.
4. Same maintenance service and source for replacement parts, as applicable, is available as that specified.
5. Proposed substitution does not affect dimensions and functional clearances, except as noted herein.

**Submitted By** \_\_\_\_\_

**Signed** \_\_\_\_\_

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

**Address** \_\_\_\_\_

**Telephone** \_\_\_\_\_

**Fax** \_\_\_\_\_

*Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in rejection of proposed substitution.*

---

**FOR QUACKENBUSH ARCHITECTS + PLANNERS USE ONLY**

- Substitution Approved – Included in Addendum No. \_\_\_\_\_
- Substitution Approved as Noted – Included in Addendum No. \_\_\_\_\_
- Substitution Rejected – Use Specified Materials
- Substitution Request Received Too Late for Review Prior to Bid – Use Specified Materials

By \_\_\_\_\_ Date \_\_\_\_\_



## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

#### 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

#### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use forms acceptable to Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

#### 1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on form included in Project Manual.

#### 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

## SECTION 012900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

#### 1.3 DEFINITIONS

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

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Owner's name.
    - c. Owner's Project number.
    - d. Name of Architect.
    - e. Architect's Project number.
    - f. Contractor's name and address.
    - g. Date of submittal.
  - 2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
    - 1) Labor.
    - 2) Materials.
    - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site.
6. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

#### 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
  1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
  - 4. Submittal schedule (preliminary if not final).
  - 5. List of Contractor's staff assignments.
  - 6. List of Contractor's principal consultants.
  - 7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
- G. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Certification of completion of final punch list items.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. AIA Document G706.
  6. AIA Document G706A.
  7. AIA Document G707.
  8. Evidence that claims have been settled.
  9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  10. Final liquidated damages settlement statement.
  11. Proof that taxes, fees, and similar obligations are paid.
  12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. RFIs.
  - 4. Digital project management procedures.
  - 5. Project meetings.
- B. Related Requirements:
  - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.



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

## 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination of Multiple Contracts: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.

5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

#### 1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
  2. Owner name.
  3. Owner's Project number.
  4. Name of Architect.
  5. Architect's Project number.
  6. Date.
  7. Name of Contractor.
  8. RFI number, numbered sequentially.
  9. RFI subject.
  10. Specification Section number and title and related paragraphs, as appropriate.
  11. Drawing number and detail references, as appropriate.
  12. Field dimensions and conditions, as appropriate.
  13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  14. Contractor's signature.
  15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow three days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number, including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.
- 1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES
- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.

2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
  - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.8 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
  - a. Responsibilities and personnel assignments.
  - b. Tentative construction schedule.
  - c. Phasing.
  - d. Critical work sequencing and long lead items.
  - e. Designation of key personnel and their duties.
  - f. Lines of communications.
  - g. Use of web-based Project software.

- h. Procedures for processing field decisions and Change Orders.
  - i. Procedures for RFIs.
  - j. Procedures for testing and inspecting.
  - k. Procedures for processing Applications for Payment.
  - l. Distribution of the Contract Documents.
  - m. Submittal procedures.
  - n. Preparation of Record Documents.
  - o. Use of the premises and existing building.
  - p. Work restrictions.
  - q. Working hours.
  - r. Owner's occupancy requirements.
  - s. Responsibility for temporary facilities and controls.
  - t. Procedures for moisture and mold control.
  - u. Procedures for disruptions and shutdowns.
  - v. Construction waste management and recycling.
  - w. Parking availability.
  - x. Office, work, and storage areas.
  - y. Equipment deliveries and priorities.
  - z. First aid.
  - aa. Security.
  - bb. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.

- o. Compatibility of materials.
  - p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction.
  - t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - j. Submittal procedures.
    - k. Coordination of separate contracts.
    - l. Owner's partial occupancy requirements.
    - m. Installation of Owner's furniture, fixtures, and equipment.
    - n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of Proposal Requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Pending claims and disputes.
      - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

- F. Coordination Meetings: Conduct Project coordination meetings at biweekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of RFIs.
      - 14) Proposal Requests.
      - 15) Change Orders.
      - 16) Pending changes.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Startup construction schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Construction schedule updating reports.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Site condition reports.
  - 7. Unusual event reports.
- B. Related Requirements:
  - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
  - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

#### 1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Event: The starting or ending point of an activity.
- D. Float: The measure of leeway in starting and completing an activity.

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
1. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.
- D. Daily Construction Reports: Submit at weekly intervals.
- E. Material Location Reports: Submit at weekly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.

#### 1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
  2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

#### 1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 10 days, unless specifically allowed by Architect.
  2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
    - a. Securing of approvals and permits required for performance of the Work.
    - b. Temporary facilities.
    - c. Construction of mock-ups, prototypes and samples.
    - d. Owner interfaces and furnishing of items.
    - e. Interfaces with Separate Contracts.
    - f. Regulatory agency approvals.
    - g. Punch list.
  3. Procurement Activities: Include procurement process activities for the following long lead-time 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.
  4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
  5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
  6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  6. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.

- c. Uninterruptible services.
  - d. Partial occupancy before Substantial Completion.
  - e. Use-of-premises restrictions.
  - f. Provisions for future construction.
  - g. Seasonal variations.
  - h. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
  - b. Submittals.
  - c. Purchases.
  - d. Mockups.
  - e. Fabrication.
  - f. Sample testing.
  - g. Deliveries.
  - h. Installation.
  - i. Tests and inspections.
  - j. Adjusting.
  - k. Curing.
  - l. Startup and placement into final use and operation.
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
  - b. Temporary enclosure and space conditioning.
  - c. Permanent space enclosure.
  - d. Completion of mechanical installation.
  - e. Completion of electrical installation.
  - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and the Contract Time.
- G. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate Final Completion percentage for each activity.
- H. Recovery Schedule: When periodic update indicates the Work is 7 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

#### 1.7 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 10 days of date established for the Notice to Proceed.
1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

#### 1.8 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Testing and inspection.
  8. Accidents.
  9. Meetings and significant decisions.
  10. Unusual events.
  11. Stoppages, delays, shortages, and losses.
  12. Meter readings and similar recordings.
  13. Emergency procedures.
  14. Orders and requests of authorities having jurisdiction.

15. Change Orders received and implemented.
  16. Construction Change Directives received and implemented.
  17. Services connected and disconnected.
  18. Equipment or system tests and startups.
  19. Partial completions and occupancies.
  20. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

#### 1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for



review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal Category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled dates for purchasing.
  - h. Scheduled date of fabrication.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### 1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Paper Submittals:
  - 1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
  - 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  - 3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
  - 4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
  - 5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  - 6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

## 1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
    - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
  - 2. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  - C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
    1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
    2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
    3. Resubmittal Review: Allow 15 days for review of each resubmittal.
    4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
      - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  - D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
    1. Note date and content of previous submittal.
    2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
    3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
  - E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
  - F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- 1.6 SUBMITTAL REQUIREMENTS
- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
    1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
    - a. Two opaque (bond) copies of each submittal. Architect will return one copy(ies).
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

- a. Project name and submittal number.
  - b. Generic description of Sample.
  - c. Product name and name of manufacturer.
  - d. Sample source.
  - e. Number and title of applicable Specification Section.
  - f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
  4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
  5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit 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 that entity. Provide a notarized signature where indicated.
  2. 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.
  3. 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.
  4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
  2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
  3. 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.
  4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

#### 1.7 DELEGATED DESIGN SERVICES

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

#### 1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
  1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
  - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
  - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300



## SECTION 013516 - ALTERATION PROJECT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes special procedures for alteration work.

#### 1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep an element or detail secure and intact.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

### 1.3 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

### 1.4 STORAGE AND HANDLING OF SALVAGED MATERIALS

#### A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label 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.

#### B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label 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 unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

#### E. Storage Space:

1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space does not include security and climate control for stored material.

## 1.5 FIELD CONDITIONS

- A. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- B. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by **12 inches (300 mm)** or more.

## PART 2 - PRODUCTS - (Not Used)

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
  - 1. Use only proven protection methods, appropriate to each area and surface being protected.
  - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
  - 3. Erect temporary barriers to form and maintain fire-egress routes.
  - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
  - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
  - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
  - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
- B. Temporary Protection of Materials to Remain:
  - 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
  - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.

2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
  3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
  2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

### 3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
  2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
  2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
  3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
  5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed.

Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

- a. Train each fire watch in the proper operation of fire-control equipment and alarms.
  - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
  - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
  - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

### 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### 3.4 GENERAL ALTERATION WORK

- A. Ensure that supervisory personnel are present when work begins and during its progress.
- B. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- C. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
1. Mockups are used for one or more of the following:
    - a. Verify selections made under Sample submittals.
    - b. Demonstrate aesthetic effects.
    - c. Demonstrate the qualities of products and workmanship.
    - d. Demonstrate successful installation of interfaces between components and systems.
    - e. Perform preconstruction testing to determine system performance.
  2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.
- 1.4 DELEGATED DESIGN SERVICES
- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.



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

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.

2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- C. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  3. Owner-performed tests and inspections indicated in the Contract Documents.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- E. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, telephone number, and email address of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement of whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement of whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

## 1.9 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
  - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
  - a. Allow seven days for initial review and each re-review of each mockup.
7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  6. Security and protection for samples and for testing and inspection equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
  - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  - 2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
  - 6. Retesting and reinspecting corrected Work.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

### 3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.



**Contractor's Statement of Responsibility  
Seismic Quality Assurance**

*To be completed by the General Contractor and every Subcontractor responsible for the construction of designated systems and components listed in the Seismic Quality Assurance Plan. Submit separate copies to the Building Official and the Owner.*

**Project Name:** Diesel Training Facility Interior Renovation  
**Owner:** Horry Georgetown Technical College

A Seismic Quality Assurance Plan has been defined for this project. The required Seismic Quality Assurance program entitled "Quality Assurance Plan for Seismic Resistance" is an attachment to Section 014000 – Quality Requirements of the Project Specifications. The program designates building elements covered and references requiring Special Inspections that are part of the Seismic Quality Assurance Plan.

As a Contractor responsible for the construction of the designated systems and components listed in the quality assurance plan, I acknowledge the following:

1. We acknowledge awareness of the special requirements contained in the quality assurance plan.
2. We acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Office of State Engineer (OSE).
3. Procedures will be maintained for exercising control within our organization to ensure compliance for the method and frequency of reporting, and for the distribution of the reports. (Attach description of the procedures to be instituted.)
4. Person(s) in our organization exercising control of the quality assurance plan requirements and their qualifications are identified in the attachment provided. (Attach list of personnel with qualifications.)

Submitted by:

\_\_\_\_\_  
(Type or Print Name of Firm)

\_\_\_\_\_  
(Type or Print Name of Firm Owner, Partner or Corp. Sec.)

\_\_\_\_\_  
Signature Date

Owner's Authorization:

\_\_\_\_\_  
Signature Date

**STATEMENT OF SPECIAL INSPECTIONS**

**Project Name:** Diesel Training Facility Interior Renovation  
**Owner:** Horry Georgetown Technical College

Architect/Engineer: Quackenbush Architects + Planners

The following firms and/or individuals are designated to perform the Special Inspections of the material or work designated below. (*Ex: Foundations, Concrete, etc.*) The firms and/or individuals have the experience, qualifications, certifications and/or licenses required to perform the special inspections indicated.

Material/Work to be Inspected: Concrete  
Firm/Individual Name: TBD  
Address: \_\_\_\_\_

Responsibilities of the special inspectors are indicated on the attached Schedule of Special Inspections. Discrepancies shall be brought to the immediate attention of the Contractor so that corrective action can be taken in a timely manner. Copies of all test reports and test data shall be obtained from the inspectors by the A/E on a timely basis.

\_\_\_\_\_  
(Print or Type Name of A/E Representative)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

**STATEMENT OF SPECIAL INSPECTIONS**

**Project Name:** Diesel Training Facility Interior Renovation  
**Owner:** Horry Georgetown Technical College

Architect/Engineer: Quackenbush Architects + Planners/ BGA Engineering

The following firms and/or individuals are designated to perform the Special Inspections of the material or work designated below. The firms and/or individuals have the experience, qualifications, certifications and/or licenses required to perform the special inspections indicated.

Material/Work to be Inspected: Mechanical & Plumbing

Firm/Individual Name: TBD  
Address: \_\_\_\_\_

Material/Work to be Inspected: Electrical Components

Firm/Individual Name: TBD  
Address: \_\_\_\_\_

Responsibilities of the special inspectors are indicated on the attached Schedule of Special Inspections. Discrepancies shall be brought to the immediate attention of the Contractor so that corrective action can be taken in a timely manner. Copies of all test reports and test data shall be obtained from the inspectors by the A/E on a timely basis.

\_\_\_\_\_  
*(Print or Type Name of A/E Representative)*

\_\_\_\_\_  
*(Signature)*

\_\_\_\_\_  
*(Date)*

SCHEDULE OF SPECIAL INSPECTIONS (2 Pages)

**Project Name:** Diesel Training Facility Interior Renovation  
**Owner:** Horry Georgetown Technical College

*Special Inspection requirements based on Section 1705 of Chapter 17 of the 2018 International Building Code and Chapter 1 of the 2018 International Building Code*

MATERIALS	TYPE OF INSPECTION	SPECIFICATION OR CODE REFERENCE	INSPECTION BY		
			ARCH	ENG	Testing Company
Concrete	Mix design/ slump, 30 days prior to work				TBD
	Cylinder Compressive strength testing				TBD
					TBD
	Trench Backfill Compaction				TBD
Concrete	Verify use of Design Mix (Periodic)				TBD
	Sample Slump, air, temp. strength (Cont)				TBD
	Concrete Placement (Cont)				TBD
	Curing (Periodic)				TBD
Suspended Ceiling Systems	Review Submittal	Division 9 ceiling systems	X		
	Inspection of installation and anchorage of suspension system (Periodic)	Division 9 ceiling systems			TBD
Concrete slab & under floor inspection	Inspection after in-slab or under-floor reinforcing and building service equipment, conduit, piping, etc are in place, but prior to concrete placement	International Building Code 2018 - 110.3.2			TBD
Frame Inspections	Inspection of framing and items that will be concealed	International Building Code 2018 - 110.3.4			TBD
Gypsum Board Inspection	Inspection of gypsum board prior to plaster, taping and finishing	International Building Code 2018 - 110.3.5			TBD
Energy Efficiency Inspections	Inspection to determine compliance with IBC Chapter 13	International Building Code 2018 - 110.3.8			TBD
	a) Duct System R-Value	Specification 230700		x	
	b) HVAC & Water Heating Equipment efficiency	Equipment Schedules on Drawings			

MATERIALS	TYPE OF INSPECTION	SPECIFICATION OR CODE REFERENCE	INSPECTION BY		
			ARCH	ENG	Testing Company
Mechanical Inspections	Rough-in inspection prior to wall or ceiling membranes	International Mechanical Code 2018 - 107.2			TBD
					TBD
Plumbing Inspections	Underground inspection after trenches or ditches are excavated and piping installed, prior to backfill in place.	International Plumbing Code 2018 - 107.2			TBD
	Rough-in inspection prior to wall or ceiling membranes	International Plumbing Code 2018 – 107.2			TBD
	Final inspection after building is complete, all plumbing fixtures are in place and properly connected, and the structure is ready for occupancy	International Plumbing Code 2018-107.2		x	
Electrical Inspections	Underground inspection after trenches or ditches are excavated and conduit installed, prior to backfill in place.	National Electrical Code 2017 – 300.5			TBD
	Rough-in inspection prior to wall or ceiling membranes	National Electrical Code 2017 – Chapter 3			TBD
Plumbing, Mechanical & Electrical Comp	Manufacturer certification required on mechanical & plumbing equipment	Specification 230548		X	
	Inspection of label & anchorage of mechanical & plumbing equipment	International Building Code 2018 – 1705.12.4, 1705.12.6			TBD
	Manufacturer certification required on electrical equipment	Specification 260548		X	
	Inspection of label & anchorage of electrical equipment	International Building Code 2018 - 1705.12.4, 1705.12.6			TBD

END OF SECTION 014000

## SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
  - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

### 1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  2. AAMA - American Architectural Manufacturers Association; (See FGIA).
  3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  8. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
  9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
  18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
  19. AITC - American Institute of Timber Construction; [www.plib.org](http://www.plib.org).
  20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
  21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
  22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
  23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
  24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
  25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
  26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).

27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
34. ASSP - American Society of Safety Professionals (The); [www.assp.org](http://www.assp.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); [www.avixa.org](http://www.avixa.org).
38. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
39. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
41. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
42. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
43. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
44. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
45. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
46. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
48. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
50. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
51. CE - Conformite Europeenne; [www.ec.europa.eu/growth/single-market/ce-marking](http://www.ec.europa.eu/growth/single-market/ce-marking).
52. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
53. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
54. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
55. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
56. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
57. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
58. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
59. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
60. CPA - Composite Panel Association; [www.compositepanel.org](http://www.compositepanel.org).
61. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
62. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
63. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
64. CSA - CSA Group; [www.csa-group.org](http://www.csa-group.org).
65. CSI - Cast Stone Institute; [www.caststone.org](http://www.caststone.org).
66. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
67. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
68. CTA - Consumer Technology Association; [www.cta.tech](http://www.cta.tech).



69. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.coolingtechnology.org](http://www.coolingtechnology.org).
70. CWC - Composite Wood Council; (See CPA).
71. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
72. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); [www.decorativehardwoods.org](http://www.decorativehardwoods.org).
73. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
74. ECA - Electronic Components Association; (See ECIA).
75. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
76. ECIA - Electronic Components Industry Association; [www.ecianow.org](http://www.ecianow.org).
77. EIA - Electronic Industries Alliance; (See TIA).
78. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
79. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
80. EOS/ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
81. ESTA - Entertainment Services and Technology Association; (See PLASA).
82. ETL - Intertek (See Intertek); [www.intertek.com](http://www.intertek.com).
83. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
84. FCI - Fluid Controls Institute; [www.fluidcontrolsintstitute.org](http://www.fluidcontrolsintstitute.org).
85. FGIA - Fenestration and Glazing Industry Alliance; <https://fgiaonline.org>.
86. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
87. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
88. FM Approvals - FM Approvals LLC; [www.fmapprovals.com](http://www.fmapprovals.com).
89. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
90. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; [www.floridarooft.com](http://www.floridarooft.com).
91. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
92. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
93. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
94. GANA - Glass Association of North America; (See NGA).
95. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
96. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
97. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
98. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
99. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
100. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
101. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
102. ICBO - International Conference of Building Officials; (See ICC).
103. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
104. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
105. ICPA - International Cast Polymer Association; [www.theicpa.com](http://www.theicpa.com).
106. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
107. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
108. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
109. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
110. IESNA - Illuminating Engineering Society of North America; (See IES).
111. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
112. IGMA - Insulating Glass Manufacturers Alliance; (See FGIA).

113. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.org](http://www.igshpa.org).
114. II - Infocomm International; (See AVIXA).
115. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
116. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
117. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
118. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
119. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
120. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
121. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
122. ITU - International Telecommunication Union; [www.itu.int](http://www.itu.int).
123. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
124. LMA - Laminating Materials Association; (See CPA).
125. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
126. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
127. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
128. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
129. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
130. MHI - Material Handling Industry; [www.mhi.org](http://www.mhi.org).
131. MIA - Marble Institute of America; (See NSI).
132. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
133. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
134. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
135. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
136. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
137. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
138. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
139. NALP - National Association of Landscape Professionals; [www.landscapeprofessionals.org](http://www.landscapeprofessionals.org).
140. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
141. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
142. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
143. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
144. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
145. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
146. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
147. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
148. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
149. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
150. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
151. NFPA - NFPA International; (See NFPA).
152. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
153. NGA - National Glass Association (The); (Formerly: Glass Association of North America); [www.glass.org](http://www.glass.org).
154. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).

155. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
156. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
157. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
158. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
159. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
160. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
161. NSI - National Stone Institute; (Formerly: Marble Institute of America); [www.naturalstoneinstitute.org](http://www.naturalstoneinstitute.org).
162. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
163. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
164. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
165. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
166. NWRA - National Waste & Recycling Association; [www.wasterecycling.org](http://www.wasterecycling.org)
167. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
168. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
169. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
170. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
171. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
172. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
173. SAE - SAE International; [www.sae.org](http://www.sae.org).
174. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
175. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
176. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
177. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
178. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
179. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
180. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
181. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
182. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
183. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
184. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
185. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
186. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
187. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
188. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
189. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
190. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
191. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
192. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
193. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
194. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
195. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
196. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
197. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).

198. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
199. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
200. TPI - Turfgrass Producers International; [www.turfgrassod.org](http://www.turfgrassod.org).
201. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
202. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
203. UL LLC - UL LLC; [www.ul.com](http://www.ul.com).
204. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
205. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
206. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
207. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
208. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
209. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
210. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
211. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
212. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
213. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
214. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
8. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).

15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
  16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
  17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
  19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.govinfo.gov](http://www.govinfo.gov).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org](http://www.wbdg.org).
  6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
  2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
  3. CDHS; California Department of Health Services; (See CDPH).
  4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx](http://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx).
  5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
  6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
  7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestservation.tamu.edu](http://www.txforestservation.tamu.edu).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

#### 1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

## PART 3 - EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.



### 3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

### 3.4 SUPPORT FACILITIES INSTALLATION

#### A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within **30 feet (9 m)** of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.

#### B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

#### C. Storage and Staging: Use designated areas of Project site for storage and staging needs.

#### D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

#### E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
  - a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs, so they are legible at all times.

#### F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

#### G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

#### A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
  1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
  2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
  4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

### 3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard and replace stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of

exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
  - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
  - 3. Section 014200 "References" for applicable industry standards for products specified.
  - 4. Section 01770 "Closeout Procedures" for submitting warranties.

#### 1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
  - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model

number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.
- 1.4 QUALITY ASSURANCE
- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
  - a. Name of product and manufacturer.
  - b. Model and serial number.
  - c. Capacity.
  - d. Speed.
  - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

#### 1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
  1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
  2. Store products to allow for inspection and measurement of quantity or counting of units.
  3. Store materials in a manner that will not endanger Project structure.
  4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
  5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.



6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
  - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
  - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
  - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

- a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
  - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
  - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
  1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type,

- function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
  2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner's portion of the Work.
  - 6. Coordination of Owner-installed products.
  - 7. Progress cleaning.
  - 8. Starting and adjusting.
  - 9. Protection of installed construction.
  - 10. Correction of the Work.
  
- B. Related Requirements:
  - 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, Owner's separate contracts, and limits on use of Project site.
  - 2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

#### 1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
  
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

#### 1.4 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Primary operational systems and equipment.
    - b. Air or smoke barriers.
    - c. Plumbing piping systems.
    - d. Mechanical systems piping and ducts.
    - e. Control systems.
    - f. Communication systems.
    - g. Fire-detection and -alarm systems.
    - h. Conveying systems.
    - i. Electrical wiring systems.
    - j. Operating systems of special construction.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.

- d. Equipment supports.
  - e. Piping, ductwork, vessels, and equipment.
  - f. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.



- B. Engage a professional engineer experienced in laying out the Work, using the following accepted surveying practices:
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
  
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
  
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

### 3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb, and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of **96 inches (2440 mm)** in occupied spaces and **90 inches (2300 mm)** in unoccupied spaces, unless otherwise indicated on Drawings.
  
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
  
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.

- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of

wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
1. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.9 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
  - B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
  - C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."
- 3.10 PROTECTION OF INSTALLED CONSTRUCTION
- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
- B. Related Requirements:
  - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
  - 2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### 1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
  - 5. Submit testing, adjusting, and balancing records.
  - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Advise Owner of pending insurance changeover requirements.
  - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 3. Complete startup and testing of systems and equipment.
  - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.



5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.9 LIST OF INCOMPLETE ITEMS

- A. Organization 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,, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, 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.
  4. Submit list of incomplete items in the following format:
    - a. PDF Electronic File: Architect will return annotated file.

#### 1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit on digital media acceptable to Architect.
- E. Warranties in Paper Form:
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch (215-by-280-mm)** paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
    - h. Vacuum and mop concrete.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - o. Clean ducts, blowers, and coils.
  
  - p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - q. Clean strainers.
  - r. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

#### 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.

4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.7 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.8 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.



2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned Record Prints and one set(s) of file prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

#### 1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - 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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

#### 1.5 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. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  3. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

#### 1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

#### 1.7 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.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

## SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

#### 1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

#### 1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

#### 1.5 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.
    - l. Required sequences for electric or electronic systems.

- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## 1.6 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

## 1.7 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.



- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

## SECTION 024119 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 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.

##### B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

#### 1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

#### 1.3 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.

#### 1.4 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.

#### 1.5 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.
- B. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

#### 1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

## 1.8 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Owner will remove the following items:
    - a. Existing walls, doors, ceilings, flooring, plumbing fixtures capped at slab, and most equipment.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage 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/ASSP 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. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 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 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. 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.
3. Disconnect, demolish, and remove plumbing and HVAC systems, equipment, and components indicated on Drawings 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 and leave in place.
- 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 and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: 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 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, 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.
- C. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 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. 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 fire watch during and for at least 2 hours after flame-cutting operations.
  6. Maintain adequate ventilation when using cutting torches.
  7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  10. Dispose of demolished items and materials promptly.

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

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch (19 mm)** at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
  - 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.
- B. Burning: Do not burn demolished materials.

### 3.8 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 024119



## SECTION 079200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Polysulfide joint sealants.
6. Butyl joint sealants.
7. Latex joint sealants.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data:

1. Joint-sealants.
2. Joint sealant backing materials.

##### B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

##### C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Sample warranties.

#### 1.4 CLOSEOUT SUBMITTALS

##### A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

## 1.5 QUALITY ASSURANCE

### A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.
2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing

## 1.6 FIELD CONDITIONS

### A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.7 WARRANTY

### A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

### B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

### C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

### 2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.3 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
  - a. [Dow Corning Corporation](#);
  - b. [GE Advanced Materials](#)
  - c. [Pecora Corporation](#);
  - d. [Sika Corporation, Construction Products Division](#);
  - e. [Tremco Incorporated](#);

### 2.4 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

**Products:** Subject to compliance with requirements, provide one of the following:

- a. [Dow Corning Corporation](#); 790.
- b. [GE Advanced Materials](#) - Silicones; SilPruf LM SCS2700.
- c. [Pecora Corporation](#); 890.
- d. [Sika Corporation, Construction Products Division](#); SikaSil-C990.
- e. [Tremco Incorporated](#); Spectrem 1.

## 2.5 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
- a. BASF Corporation; Construction Systems.
  - b. Pecora Corporation.
  - c. Polymeric Systems, Inc.
  - d. Sika Corporation; Joint Sealants.
  - e. Tremco Incorporated.

## 2.6 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
- a. GE Construction Sealants; Momentive Performance Materials Inc.
  - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
  - c. Pecora Corporation.
  - d. The Dow Chemical Company.
  - e. Tremco Incorporated.

## 2.7 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
- a. Bostik, Inc.
  - b. Pecora Corporation.

## 2.8 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
  - 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [May National Associates, Inc.; a subsidiary of Sika Corporation.](#)
    - b. [Pecora Corporation.](#)
    - c. [Sherwin-Williams Company \(The\).](#)
    - d. [Tremco Incorporated.](#)

## 2.9 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.10 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

- 1. Joint Locations:
  - a. Tile control and expansion joints.
  - b. Joints between different materials listed above.
- 2. Joint Sealant: Urethane, M, P, 50, T, NT.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

- 1. Joint Locations:
  - a. Construction joints in cast-in-place concrete.
  - b. Control and expansion joints in unit masonry.
  - c. Joints between metal panels.
  - d. Joints between different materials listed above.
  - e. Perimeter joints between materials listed above and frames of doors windows and louvers.
  - f. Control and expansion joints in ceilings and other overhead surfaces.
  - g. Other joints as indicated on Drawings.
- 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

- 1. Joint Locations:
  - a. Isolation joints in cast-in-place concrete slabs.
  - b. Control and expansion joints in tile flooring.
  - c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Urethane, S, P, 25, T, NT.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

- 1. Joint Locations:



- a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of unit masonry concrete walls and partitions.
    - d. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
  1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors windows.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
  1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Butyl-rubber based.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

#### 1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum **4-inch- (102-mm-)** high wood blocking. Provide minimum **1/4-inch (6-mm)** space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
  - 1. Ceco Door; AADG, Inc.; ASSA ABLOY.
  - 2. Curries, AADG, Inc.; ASSA ABLOY Group.
  - 3. Fleming Door Products Ltd.; ASSA ABLOY Group.
  - 4. Republic Doors and Frames; a Allegion brand.
  - 5. Steelcraft; Allegion plc.

### 2.2 INTERIOR CUSTOM HOLLOW-METAL DOORS AND FRAMES

- A. Commercial Doors and Frames: NAAMM-HMMA 861; ANSI/SDI A250.4, Physical Performance Level A..
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: **1-3/4 inches (44.5 mm)**.
    - a. Face: Metallic-coated steel sheet, minimum thickness of **0.053 inch (1.30 mm)**, with minimum **G60 or A60 (ZF180)** coating.
    - b. Edge Construction: Continuously welded with no visible seam.
    - c. Core: Steel stiffened.
  - 2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of **0.053 inch (1.3 mm)**, except **0.067 inch (1.7 mm)** for openings exceeding **4 feet (1219 mm)** wide.
- b. Sidelite Frames: Fabricated from same material as adjacent door frame.
- c. Construction: Full profile welded.

3. Exposed Finish: Prime.

## 2.3 BORROWED LITES

- A. Fabricate of metallic-coated steel sheet, minimum thickness of **0.053 inch (1.3 mm)**.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.4 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each **24 inches (610 mm)** of frame height above **7 feet (2.1 m)**.
  3. Postinstalled Expansion Anchor: Minimum **3/8-inch- (9.5-mm-)** diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), **04Z (12G)** coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

## 2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.7 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.
  - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than **9 inches (230 mm)** o.c. and not more than **2 inches (51 mm)** o.c. from each corner.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

- a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
- b. Install frames with removable stops located on secure side of opening.
2. Floor Anchors: Secure with postinstalled expansion anchors.
  - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Solidly pack mineral-fiber insulation inside frames.
4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
  - a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### 3.3 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

## SECTION 083323 - OVERHEAD COILING DOORS – ALTERNATE #1

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Insulated service doors.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
  2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
1. Include plans, elevations, sections, and mounting details.
  2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
  5. Show locations of controls, locking devices, and other accessories.
  6. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
1. Include similar Samples of accessories involving color selection.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.



#### 1.4 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
- B. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
1. Design Wind Load: Uniform pressure (velocity pressure) of **40 lbf/sq. ft.**, acting inward and outward.
  2. Testing: According to ASTM E330/E330M.
  3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
  4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of **40-lbf/sq. ft.** wind load, acting inward and outward.
- C. Windborne-Debris Impact Resistance: Provide impact-protective overhead coiling doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 1 for basic protection.
1. Large-Missile Test: For overhead coiling doors located within **30 ft. (9.1 m)** of grade.
- D. Seismic Performance: Overhead coiling doors are to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor: 1.0.

#### 2.2 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; Stormlite Model 625 or a comparable product by one of the following:
    - a. C.H.I. Overhead Doors, Inc.
    - b. Cookson; a CornellCookson company.
    - c. Cornell; a CornellCookson company.

- d. McKeon Door Company.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Air Infiltration: Maximum rate of 1 cfm/sq. ft. at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283.
- D. Insulated Door Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).
- E. Insulated Door Assembly U-Factor: 0.90 Btu/deg F x h x sq. ft. (5.1 W/K x sq. m).
- F. Door Curtain Material: Galvanized steel.
- G. Door Curtain Slats: Flat profile slats of 1-7/8-inch (48-mm) center-to-center height.
1. Insulated-Slat Interior Facing: Metal.
- H. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from hot-dip galvanized steel and finished to match door.
- I. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- J. Hood: Match curtain material and finish.
1. Shape: Round.
2. Mounting: Face of wall.
- K. Electric Door Operator:
1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Front of hood.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. (2.44 m) or lower.
4. Motor Exposure: Interior.
5. Motor Electrical Characteristics:
- a. Horsepower: 3 hp.
- b. Voltage: 108 V, three phase, 60 Hz.
6. Emergency Manual Operation: Chain or Crank type.
7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
- a. Sensor Edge Bulb Color: Black.
8. Control Station(s): Interior mounted Where indicated on Drawings.
- L. Curtain Accessories: Equip door with weatherseals and pole hook.

- M. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
  2. Factory Prime Finish: Manufacturer's standard color.
  3. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

## 2.3 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm); and as required.
  2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
  3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

## 2.5 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized-steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.

## 2.6 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  - 1. Lock Cylinders: As standard with manufacturer and keyed to building keying system.
  - 2. Keys: Two Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.7 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
  - 1. At door head, use **1/8-inch- (3-mm-)** thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
  - 2. At door jambs, use replaceable, adjustable, continuous, flexible, **1/8-inch- (3-mm-)** thick seals of flexible vinyl, rubber, or neoprene or nylon brushes.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- C. Pull-Down Strap: Provide pull-down straps for doors more than **84 inches (2130 mm)** high.
- D. Pole Hooks: Provide pole hooks and poles for doors more than **84 inches (2130 mm)** high.

## 2.8 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than **0.03 in./ft. (2.5 mm/m)** of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.9 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
  - 1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
  - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than **8 in./sec. (203 mm/s)** and not more than **12 in./sec. (305 mm/s)**, without exceeding nameplate ratings or service factor.
  - 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
  - 1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

## 2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.11 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

### 3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
  - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
  - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

### 3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
  - 1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323



## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Mechanical door hardware for the following:
  - a. Swinging doors.

##### B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Section 083323 "Overhead Coiling Doors" for door hardware provided as part of overhead coiling door assemblies.

#### 1.2 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

##### B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware

schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:
  - a. Identification number, location, hand, size, and material of each door and frame.
  - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
  - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
  - d. Fastenings and other installation information.
  - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
  - f. Mounting locations for door hardware.
  - g. List of related door devices specified in other Sections for each door and frame.

- C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- B. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
  1. Warehousing Facilities: In Project's vicinity.
  2. Scheduling Responsibility: Preparation of door hardware and keying schedule.

- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC).

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including excessive deflection, cracking, or breakage.
    - b. Faulty operation of doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
    - a. Exit Devices: Two years from date of Substantial Completion.
    - b. Manual Closers: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Means of Egress Doors: Latches do not require more than **15 lbf (67 N)** to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC A117.1.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
  2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
  3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
  4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
  5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

## 2.3 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

## 2.4 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
- C. Lock Trim:
1. Description: As indicated in Schedule.
  2. Levers: Cast.
  3. Escutcheons (Roses): Cast.
  4. Dummy Trim: Match lever lock trim and escutcheons.
- D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

E. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

## 2.6 AUXILIARY LOCKS

A. Mortise Auxiliary Locks: BHMA A156.36; Grade 1; with strike that suits frame.

## 2.7 SURFACE BOLTS

A. Surface Bolts: BHMA A156.16.

## 2.8 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

## 2.9 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.

1. Core Type: Interchangeable.

C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

## 2.10 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Existing System:

- a. Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
  - a. Notation: Information to be furnished by Owner.

## 2.11 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel unless otherwise indicated.

## 2.12 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

## 2.13 CONCEALED CLOSERS

- A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

## 2.14 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.

## 2.15 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Maximum Air Leakage: When tested in accordance with ASTM E283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
  1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.

## 2.16 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

## 2.17 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from **0.050-inch- (1.3-mm-)** thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

## 2.18 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.

## 2.19 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
  - 1. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
  - 2. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

## 2.20 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, all and floor construction, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
- B. 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.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every **30 inches (750 mm)** of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every **30 inches (750 mm)** of door height greater than **90 inches (2286 mm)**.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as indicated in keying schedule.
  - 2. Furnish permanent cores to Owner for installation.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.



- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
  - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.5 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 that door hardware is without damage or deterioration at time of Substantial Completion.

### 3.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### 3.7 DEMONSTRATION

- A. Engage Installer to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.


### 3.8 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

**EXT-01 - EXISTING EXTERIOR HOLLOW METAL DOORS:**

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	SFIC MORTISE HOUSING LESS CORE	20-059 X K510-730		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH








1. CONTRACTOR TO FEILD VERIFY THE NUMBER OF EXISTING EXTERIOR DOORS TO RECEIVE NEW MASTER KEYED CYLINERS.
2. CONTRACTOR TO VERIFY EXISTING CONDITIONS AND LOCK TYPE COMPATIBILTY TO RECEIVE NEW MASTER KEYED CYLINDERS.

**EXT-02 - SINGLE, AL STOREFRONT, O/S, OFFICE**

For use on Door #(s):

EXT ALUM  
 STOREFRONT  
 OFFICE

Provide each SGL door(s) with the following:








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	157XY		628	IVE
1	EA	INTERCONNECT LOCK	2190-3-1-1-1-01-32D		628	ADA
1	EA	MORTISE CYL TURN	09-905 118 XB11-720 36-083		626	SCH
1	EA	MORTISE CYLINDER	20-060 X K510-711		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		689	LCN
1	EA	FLOOR STOP	FS18L		BLK	IVE
1	EA	DOOR SWEEP	39A		A	ZER

**EXT-03 - SINGLE, AL STOREFRONT, O/S, LOBBY**

For use on Door #(s):

EXT ALUM  
 STOREFRONT  
 LOBBY

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	157XY		628	IVE
1	EA	DEADLOCK	MS1850S-2-1-0-628		628	ADA
1	EA	MORTISE CYL TURN	09-905 118 XB11-720 36-083		626	SCH
1	EA	MORTISE CYLINDER	20-060 X K510-711		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	PUSH/PULL BAR	9145EZHD-12"-NS		630	IVE
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		689	LCN
1	EA	FLOOR STOP	FS18L		BLK	IVE
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THIS DOOR TO REMAIN UNLOCKED DURING BUSINESS HOURS SIGNAGE	DD 1		ALM	DON






**INT-01 - OFFICE:**

Hardware Group No. INT-01 - OFFICE

For use on Door #(s):

101                    112                    113                    114









Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A L583-363		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

**INT-02 - TOILET:**

For use on Door #(s):  
 102                      103








Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 4" X 16"		630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	KICK PLATE	8400 8" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

**INT-03 - I/S STRRM:**

For use on Door #(s):  
 104







Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080T 17A		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP H		689	LCN
1	EA	KICK PLATE	8400 8" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

**INT-04 - 98-L-NL/ 4040XP HCUSH:**

For use on Door #(s):  
 105






Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	PANIC HARDWARE	98-L-NL-17		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN
3	EA	SILENCER	SR64		GRY	IVE

**INT-05 - O/S STRRM:**

For use on Door #(s):  
 105A                    115B                    115C

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	L9080T 17A		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN
3	EA	SILENCER	SR64		GRY	IVE

**INT-06 - CASED OPENING**

For use on Door #(s):  
 106

Provide each CO door(s) with the following:






QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	NOTE	CASED OPENING NO HDWE REQUIRED			

**INT-07 - L9070T/ 4040XP**

For use on Door #(s):

107                    108

Provide each SGL door(s) with the following:






QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	WALL STOP	WS406/407CVX		630	IVE

**INT-08 – PASSAGE**

For use on Door #(s):

109                    111

Provide each SGL door(s) with the following:







QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 17A		626	SCH
1	EA	SURFACE CLOSER	4040XP H		689	LCN
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

**INT-09 - CLASSROOM/ 4040XP/ SEALS**

For use on Door #(s):

110

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A		626	SCH
1	EA	FSIC CORE	23-030 EV29 T		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

END OF SECTION 087100

## SECTION 088000 - GLAZING

### 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. Glass products.
  - 2. Glazing sealants.
  - 3. Glazing tapes.
  - 4. Miscellaneous glazing materials.

#### 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.

#### 1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturers of fabricated glass units.



- B. Product Certificates: For glass.
- C. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

#### 1.7 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.
- B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

## 1.10 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
1. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on LBL's WINDOW 7 computer program.
  4. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
  - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

## 2.6 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates,

- under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.
- B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
1. [Dow Corning Corporation.](#)
  2. [GE Construction Sealants; Momentive Performance Materials Inc.](#)
  3. [May National Associates, Inc.; a subsidiary of Sika Corporation.](#)
  4. [Pecora Corporation.](#)
  5. Sika Corporation.
  6. [Tremco Incorporated.](#)

## 2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:

1. EPDM Silicone Neoprene with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:

1. EPDM Silicone Neoprene or Santoprene with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.

3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
  1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  2. Provide **1/8-inch- (3-mm-)** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

#### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without

developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.7 LAMINATED GLASS SCHEDULE

- A. Clear Laminated Glass Type (LG-1): Two plies of fully tempered float glass.
  - 1. Minimum Thickness of Each Glass Ply: 6 mm.
  - 2. Interlayer Thickness: 0.060 inch (1.52 mm).
  - 3. Safety glazing required.

END OF SECTION 088000



## SECTION 089119 - FIXED LOUVERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Fixed extruded-aluminum louvers.
  2. Blank-off panels for louvers

#### 1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.
- E. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing in accordance with AMCA 540.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
  2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed in accordance with AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- B. Windborne-debris-impact-resistance test reports.
- C. Sample Warranties: For manufacturer's special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

#### 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.7 WARRANTY

- A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures are considered to act normal to the face of the building.
1. Wind Loads:
    - a. Determine loads based on a uniform pressure of **30 lbf/sq. ft. (1436 Pa)**, acting inward or outward.
  - B. Windborne-Debris-Impact Resistance: Louvers located within **30 feet (9.1 m)** of grade pass basic protection, when tested in accordance with AMCA 540.
  - C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.
  - D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
    1. Temperature Change (Range): **120 deg F (67 deg C)**, ambient; **180 deg F (100 deg C)**, material surfaces.
  - E. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

## 2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade, Windborne-Debris-Impact-Resistant Louver, Extruded Aluminum
1. Ruskin HZ700MD
  2. Louver Depth: **6 inches (150 mm)**.
  3. Frame and Blade Nominal Thickness: Not less than **0.080 inch (2.03 mm)**.
  4. Mullion Type: Exposed.
  5. Louver Performance Ratings:
    - a. Free Area: Not less than **8.5 sq. ft. (0.79 sq. m)** for **48-inch- (1220-mm-)** wide by **48-inch- (1220-mm-)** high louver.
    - b. Point of Beginning Water Penetration: Not less than **1077 fpm (5.5 m/s)**.
    - c. Air Performance:
      - 1) Not more than **0.15-inch wg (37-Pa)** static pressure drop at **1077-fpm (5.5-m/s)** free-area exhaust velocity.
  6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
  7. AMCA Rating: AMCA 540.

## 2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
  - 1. Screen Location for Fixed Louvers: Interior face.
  - 2. Screening Type: Bird screening.
- B. Secure screen frames to louver frames with stainless steel machine screws, spaced a maximum of **6 inches (150 mm)** from each corner and at **12 inches (300 mm)** o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
  - 2. Finish: Same finish as louver frames to which louver screens are attached.
  - 3. Type: Non-rewirable, U-shaped frames.
- D. Louver Screening for Aluminum Louvers:
  - 1. Bird Screening, Stainless Steel: **1/2-inch- (13-mm-)** square mesh, **0.047-inch (1.19-mm)** wire.

## 2.5 BLANK-OFF PANELS

- A. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
  - 1. Thickness: **2 inches (50 mm)**.
  - 2. Metal Facing Sheets, Aluminum: Not less than **0.032-inch (0.81-mm)** nominal thickness.
  - 3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
  - 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than **0.080-inch (2.03-mm)** nominal thickness, with corners mitered and with same finish as panels.
  - 5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
  - 6. Panel Finish: Same finish applied to louvers.
  - 7. Attach blank-off panels with clips.

## 2.6 MATERIALS

- A. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: **ASTM B209 (ASTM B209M)**, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Galvanized-Steel Sheet: ASTM A653/A653M, **G60 (Z180)** zinc coating, mill phosphatized.
- D. Fasteners: Use types and sizes to suit unit installation conditions.
  - 1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
  - 2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.

- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Channel, Exterior flange unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.

## 2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.
  - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
  - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### 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. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- B. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

#### 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.

2. Protective Coating: ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645.
1. Steel Studs and Tracks:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) MBA Building Supplies.
      - 3) MRI Steel Framing, LLC.
      - 4) Phillips Manufacturing Co.
      - 5) Steel Network, Inc. (The).
      - 6) Telling Industries.
    - b. Minimum Base-Steel Thickness: 0.0329 inch (0.836 mm).
    - c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Track System: ASTM C645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
  2. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
  3. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) ClarkDietrich Building Systems.
      - 3) MBA Building Supplies.
      - 4) Metal-Lite.
      - 5) Steel Network, Inc. (The).
      - 6) Telling Industries.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: 0.0329 inch (0.836 mm).
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm).
  2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.



1. Minimum Base-Steel Thickness: **0.0329 inch (0.836 mm)**.
  2. Depth: As indicated on Drawings.
- G. Cold-Rolled Furring Channels: **0.053-inch (1.34-mm)** uncoated-steel thickness, with minimum **1/2-inch- (13-mm-)** wide flanges.
1. Depth: As indicated on Drawings.
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of **0.0329 inch (0.8 mm)**.
  3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm-)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
  2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, **1/8 inch (3.2 mm)** thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than  $1/8$  inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 092216

## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Interior gypsum board.

##### B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For the following:

1. Gypsum board, Type X.
2. Abuse-resistant gypsum board.
3. Mold-resistant gypsum board.
4. Interior trim.
5. Joint treatment materials.
6. Laminating adhesive.
7. Sound-attenuation blankets.

#### 1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. American Gypsum.
- b. Certainteed; SAINT-GOBAIN.
- c. Georgia-Pacific Gypsum LLC.
- d. National Gypsum Company.
- e. PABCO Gypsum.
- f. USG Corporation.

2. Thickness: **5/8 inch (15.9 mm)**.

3. Long Edges: Tapered.

- B. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. American Gypsum.
- b. Certainteed; SAINT-GOBAIN.
- c. Georgia-Pacific Gypsum LLC.
- d. National Gypsum Company.
- e. PABCO Gypsum.
- f. USG Corporation.

2. Core: **5/8 inch (15.9 mm)**, Type X.

3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.

4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.

5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.

6. Long Edges: Tapered.
  7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum.
    - b. Certainteed; SAINT-GOBAIN.
    - c. Georgia-Pacific Gypsum LLC.
    - d. National Gypsum Company.
    - e. PABCO Gypsum.
    - f. USG Corporation.
  2. Core: **5/8 inch (15.9 mm)**, Type X.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

## 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.

## 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

- a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

## 2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
  1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.5 mm)** of open space between panels. Do not force into place.

- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound or air ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: As indicated on Drawings.
  - 2. Abuse-Resistant Type: As indicated on Drawings.
  - 3. Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated, and minimize end joints.



- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - b. At high walls, install panels horizontally unless otherwise indicated.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated. Stagger joints on opposite sides of partitions.
  2. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

### 3.4 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners.
  2. LC-Bead: Use at exposed panel edges.
  3. L-Bead: Use where indicated.
  4. U-Bead: Use at exposed panel edges.

### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 3: NA.
  - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
  - 5. Level 5: NA.

### 3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

## SECTION 093013 - CERAMIC TILING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Porcelain tile.
  - 2. Waterproof membrane for thinset applications.
  - 3. Crack isolation membrane.
  - 4. Metal edge strips.

#### 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Face Size: Actual tile size, excluding spacer lugs.
- D. Module Size: Actual tile size plus joint width indicated.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
  - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

## 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

## 2.3 TILE PRODUCTS

- A. Ceramic Tile Type PT-1, PTB-1: Unglazed porcelain floor tile.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. American Olean; a division of Dal-Tile Corporation.
    - b. Crossville, Inc.
    - c. Daltile.
    - d. Florida Tile, Inc.
    - e. Florim USA.
    - f. Interceramic.
  - 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 3. Face Size: As indicated on drawings.
  - 4. Thickness: **.04 inches.**
  - 5. Face: Rectified with Grip Texture.
  - 6. Dynamic Coefficient of Friction: Not less than 0.42.
  - 7. Tile Color, Glaze, and Pattern: As indicated by manufacturer's designations.
  - 8. Grout Color: As selected by Architect from manufacturer's full range.

9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Outside Corner Cove
  - b. Inside Corner Cove

#### 2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
  - a. [Laticrete International, Inc – Hydro Ban.](#)

#### 2.5 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
  1. [Manufacturers:](#) Subject to compliance with requirements, provide products by the following:
    - a. [Laticrete International, Inc 254 Platinum.](#)
  2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

#### 2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3.
  1. [Basis-of-Design Product:](#) Subject to compliance with requirements, provide LATICRETE CUPERCAP, LLC. Spectralock Pro Grout or comparable product by one of the following:
  2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 and 212 deg F (60 and 100 deg C)**, respectively, and certified by manufacturer for intended use.

#### 2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

## 2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
  - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot (1:50)** toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.3 INSTALLATION OF CERAMIC TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.



1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: **1/4 inch (6.4 mm)**.

G. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

H. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### 3.4 INSTALLATION OF WATERPROOF MEMBRANE

A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

### 3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

### 3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### 3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

#### A. Interior Floor Installations, Concrete Subfloor:

- 1. Ceramic Tile Installation PT-1: TCNA F122; thinset mortar on waterproof membrane.
  - a. Ceramic Tile Type: Porcelain Tile.
  - b. Thinset Mortar: Modified dry-set mortar.
  - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093013

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### 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 acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm)** in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Panels: Set of **6-inch- (150-mm-)** square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of **6-inch- (150-mm-)** long Samples of each type, finish, and color.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- D. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E1264.
  - 2. Smoke-Developed Index: 50 or less.

### 2.3 ACOUSTICAL PANELS **APC-1**

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corporation
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
  - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
  - 2. Pattern: CE (perforated, small holes and lightly textured).
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.84.
- E. Ceiling Attenuation Class (CAC): Not less than 40.
- F. Noise Reduction Coefficient (NRC): Not less than 0.55.
- G. Edge/Joint Detail: Square.
- H. Thickness: **5/8 inch (15 mm)**.
- I. Modular Size: **24 by 24 inches (610 by 610 mm)** As indicated on Drawings.
- J. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

### 2.4 METAL SUSPENSION SYSTEM **APC-1**

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corporation

- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
  - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
  - 1. Structural Classification: Heavy-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Hot-dip galvanized, G30 (Z90) coating.
  - 1. Cap Finish: Baked-on polyester paint.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Postinstalled expansion anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- (3.5-mm-) diameter wire.
- C. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
  - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
  - 3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.

- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required and, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  7. Do not attach hangers to steel deck tabs.
  8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  9. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
  10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.



1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
2. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

#### 3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.

#### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

#### 3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Thermoset-rubber base.
  - 2. Rubber molding accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than **12 inches (300 mm)** long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than **10 linear feet (3 linear m)** for every **500 linear feet (150 linear m)** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F (10 deg C)** or more than **90 deg F (32 deg C)**.

## 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 THERMOSET-RUBBER BASE RB-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
  - 3. Flexco.
  - 4. Roppe Corporation
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
  - 1. Style and Location:
    - a. Style B, Cove: Provide in areas with resilient floor coverings.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors: As indicated by manufacturer's designations.

## 2.2 RUBBER MOLDING ACCESSORY

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Roppe Corporation; Roppe Holding Company.
  - 2. VPI Corporation.
- B. Description: Rubber reducer strip for resilient floor covering transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by architect from manufacturer's full range.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. Miter or cope corners to minimize open joints.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

## SECTION 096519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Quartz composition floor tile.
  - 2. Luxury vinyl tile

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples: Full-size units of each color, texture, and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

#### 1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:
  1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.



## 2.2 QUARTZ COMPOSITION FLOOR TILE (QT)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Altro USA, Inc.
  - 2. Johnsonite; a Tarkett company.
- B. Tile Standard: ASTM F1066, Class 2, through pattern.
- C. Wearing Surface: Smooth.
- D. Thickness: **0.08 inch (2.0 mm)**.
- E. Size: **12 by 12 inches (305 by 305 mm)**.
- F. Colors and Patterns: As indicated by manufacturer's designations.

## 2.3 LUXURY VINYL TILE (LVT)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. ShawContract.
  - 2. Johnsonite; a Tarkett company
  - 3. Armstrong.
- B. Tile Standard: ASTM F1700, Class III, Type B, embossed surface.
- C. Wearing Surface: 40 mil embossed.
- D. Thickness: **0.100 inch (2.5 mm)**.
- E. Size: As indicated on drawings.
- F. Colors and Patterns: As indicated by manufacturer's designations.

## 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
  - 1. Basis of Design: Amtico High Pressure Sensitive, Full Spread Adhesive for LVT suitable for RH 90%, MVER 8, pH5-9.
  - 2. Basis of Design: UPO Premium PSA Adhesive for QT

- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.

2. Sweep and vacuum surfaces thoroughly.
  3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
1. Apply two coat(s).
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

## SECTION 09 7700 – FIBERGLASS REINFORCED WALL PANELS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.
  - 1. PVC trim.
- B. Products Not Furnished or Installed under This Section:
  - 1. Gypsum substrate board.
  - 2. Resilient Base.

#### 1.3 RELATED SECTIONS

- A. Section 092900 – Gypsum board.
- B. Section 099124 – Interior Painting
- C. Section 096513 - Resilient Base and accessories

#### 1.4 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
  - 1. ASTM D 256 - Izod Impact Strengths (ft #/in)
  - 2. ASTM D 570 - Water Absorption (%)
  - 3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
  - 4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
  - 5. ASTM D 2583- Barcol Hardness
  - 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
  - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

#### 1.5 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:

1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
1. Submit complete with specified applied finish.
  2. For selected patterns show complete pattern repeat.
  3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site

#### 1.6 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
    - a. Wall Required Rating – Class A.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.9 WARRANTY

- A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Kal-Lite.
  2. Crane Composites
  3. Nudo
- B. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
1. Dimensions:
    - a. Thickness – 0.090 “ (2.29mm) nominal
    - b. Width - 4'-0” (1.22m) nominal
    - c. Length – As indicated on the drawings nominal
  2. Tolerance:
    - a. Length and Width: +/-1/8 “ (3.175mm)
    - b. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels
- C. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
1. Flexural Strength -  $1.7 \times 10^4$  psi per ASTM D 790.
  2. Flexural Modulus –  $6.0 \times 10^5$  psi per ASTM D 790.
  3. Tensile Strength –  $8.0 \times 10^3$  psi per ASTM D 638.
  4. Tensile Modulus –  $9.43 \times 10^5$  psi per ASTM D 638.
  5. Water Absorption - 0.17% per ASTM D 570.
  6. Barcol Hardness (scratch resistance) of 30 as per ASTM D 2583.
  7. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256
- D. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- E. Front Finish: In accordance with preapproved sample.
- a. Fire Rating: Class A.
  - b. Size: as indicated on drawings.

2.2 MOLDINGS

- A. PVC Trim: Thin-wall semi-rigid extruded PVC.
1. M 350 Inside Corner

2. M 365 Division
3. M 370 Edge
4. Color: to match panel

### 2.3 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
  1. Match panel colors.
  2. Length to suit project conditions.
- B. Adhesive: manufacturer's standard adhesives complying with ASTM C 557.
- C. Sealant: manufacturer's standard clear silicone sealant

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
  1. Verify that stud spacing does not exceed 24" (61cm) on-center.
- B. Repair defects prior to installation.
  1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

### 3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
  1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
  2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
    - a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
    - b. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
  1. Install panels with manufacturer's recommended gap for panel field and corner joints.
    - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
    - b. Drive fasteners for snug fit. Do not over-tighten.



- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
  - 1. All moldings must provide for a minimum 1/8 "(3mm) of panel expansion at joints and edges, to insure proper installation.
  - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

### 3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 09 7700

## SECTION 099124 - PAINTING (MPI STANDARDS)

### 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 surface preparation and the application of paint systems on the following interior substrates:
  - 1. Concrete.
  - 2. Concrete masonry units (CMUs).
  - 3. Steel and iron.
  - 4. Galvanized metal.
  - 5. Gypsum board.
  - 6. Cotton or canvas insulation covering.
  - 7. ASJ insulation covering.
  - 8. Bituminous-coated surfaces.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, **8 inches (200 mm)** square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than **1 gal. (3.8 L)** of each material and color applied.

#### 1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft. (9 sq. m)**.
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F (7 deg C)**.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F (10 and 35 deg C)**.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Sherwin-Williams Company (The) or comparable product by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. PPG Paints.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

### 2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As indicated in a color schedule.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Fiber-Cement Board: 12 percent.
  - 3. Masonry (Clay and CMUs): 12 percent.
  - 4. Gypsum Board: 12 percent.
  - 5. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 2.
  - 2. SSPC-SP 3.
  - 3. SSPC-SP 7/NACE No. 4.
  - 4. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

### 3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
  - a. Equipment, including panelboards and switch gear.
  - b. Uninsulated metal piping.
  - c. Uninsulated plastic piping.
  - d. Pipe hangers and supports.
  - e. Metal conduit.
  - f. Plastic conduit.
  - g. Tanks that do not have factory-applied final finishes.
  - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint the following work where exposed in occupied spaces:
  - a. Equipment, including panelboards.
  - b. Uninsulated metal piping.
  - c. Uninsulated plastic piping.
  - d. Pipe hangers and supports.
  - e. Metal conduit.
  - f. Plastic conduit.
  - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
  1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

#### A. Concrete Substrates, Traffic Surfaces:

##### 1. Water-Based Concrete Floor Sealer System:

- a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
- b. Topcoat: Sealer, water based, for concrete floors.

1) Sherwin Williams; 10.100005 - CLRTP SB SLR CLEAR

##### 2. Solvent-Based Concrete Floor Sealer System:

- a. First Coat: Sealer, solvent based, for concrete floors, matching topcoat.
- b. Topcoat: Sealer, solvent based, for concrete floors.

1) Sherwin Williams; B67C02000 - ArmorSeal® 1000 HS Epoxy (Part A) Charcoal

#### B. CMU Substrates:

##### 1. Latex System:

- a. Block Filler: Block filler, latex, interior/exterior.

1) Sherwin Williams; B25W00025 - PrepRite® Interior/Exterior Latex Block Filler White.

- b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, semigloss (MPI Gloss Level 5).

1) Sherwin Williams; B66W01501 - MULTI ACRY EX WHT.

#### C. Steel Substrates:

##### 1. Latex System, Alkyd Primer:

- a. Prime Coat: Primer, alkyd, quick dry, for metal.

1) Sherwin Williams; B50WZ0001 - Kem Kromik® Universal Metal Primer Off White.

- b. Intermediate Coat: Latex, interior, matching topcoat.



- c. Topcoat: Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees).

- 1) Sherwin Williams; B54W00101 - Industrial Enamel Pure White.

D. Gypsum Board Substrates:

1. High-Performance Architectural Latex System (Previously Coated):

- a. Topcoat (2 coats): Latex, interior, high performance architectural (MPI Gloss Level 4).

- 1) Sherwin Williams; B31W02651 - ProMar® 200 Zero VOC Interior Latex Semi-Gloss Extra White.

2. High-Performance Architectural Epoxy System:

- a. Prime Coat: Primer sealer, latex, interior.

- 1) Sherwin Williams; B28W00200 - ProMar® 200 Interior Latex Primer White.

- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

- c. Topcoat: Epoxy, interior, high performance architectural (MPI Gloss Level 4).

- 1) Sherwin Williams; B70W00211 - Waterbased Catalyzed Epoxy (Part A) Extra White/Tint Base.

END OF SECTION 099124

## SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

### 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. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
  - 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted toilet accessories.
  - 3. Show locations of centerlines of toilet fixtures.
  - 4. Show locations of floor drains.
  - 5. Show overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
  - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for toilet compartments, prepared on **6-inch- (152-mm-)** square Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hinges: One hinge(s) with associated fasteners.
  - 2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
  - 3. Door Bumper: One door bumper(s) with associated fasteners.
  - 4. Door Pull: One door pull(s) with associated fasteners.
  - 5. Fasteners: Ten fasteners of each size and type.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

#### 2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Bobrick Washroom Equipment, Inc.
  - 2. Bradley Corporation

3. General Partitions Mfg. Corp.
4. Global Partitions Corp., an ASI Group Company.
5. Partition Systems International of South Carolina
6. PSISC

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Overhead braced.

D. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum **3/4-inch- (19-mm-)** thick doors and pilasters and minimum **1/2-inch- (13-mm-)** thick panels.

E. Pilaster Shoes and Sleeves (Caps): Formed from stainless steel sheet, not less than **0.031-inch (0.79-mm)** nominal thickness and **3 inches (76 mm)** high, finished to match hardware.

F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.

G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

H. Phenolic-Panel Finish:

1. Facing Sheet Finish: One color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard through-color core matching face sheet.
3. Edge Color: Through-color matching facing sheet color.

## 2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum **0.062-inch- (1.59-mm-)** thick stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless steel bumper at out-swinging doors. Mount with through-bolts.

5. Door Pull: Manufacturer's heavy-duty cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.4 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: **ASTM B221** (ASTM B221M).

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

## 2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide **24-inch-** (610-mm-) wide in-swinging doors for standard toilet compartments and **36-inch-** (914-mm-) wide out-swinging doors with a minimum **32-inch-** (813-mm-) wide clear opening for compartments designated as accessible.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: **1/2 inch (13 mm)**.
    - b. Panels and Walls: **1 inch (25 mm)**.
  - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

#### 3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17

## SECTION 102600 - WALL AND DOOR PROTECTION

### 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. Corner guards.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
  - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
  - 1. Include Samples of accent strips and accessories to verify color selection.
- D. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
  - 1. Corner Guards: **12 inches (300 mm)** long. Include example top caps.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of exposed plastic material.
- B. Sample Warranty: For special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than **70 deg F (21 deg C)** during the period plastic materials are stored.
  - 2. Keep plastic materials out of direct sunlight.
  - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of **70 deg F (21 deg C)**.
    - a. Store corner-guard covers in a vertical position.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.



## 2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in ICC A117.1.

## 2.3 CORNER GUARDS

- A. Surface-Mounted, Opaque-Plastic Corner Guards CG-2: Fabricated as one piece from PVC plastic; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
1. **Basis-of-Design Product:** Subject to compliance with requirements, provide [wallProtex](#); WX12 or a comparable product by one of the following:
    - a. [Construction Specialties, Inc.](#)
    - b. [Inpro Corporation.](#)
    - c. [Korogard Wall Protection Systems; a division of RJF International Corporation.](#)
  2. Wing Size: Nominal **1-1/8 by 1-1/8 inches (30 by 30 mm)**.
  3. Mounting: Adhesive.
  4. Color and Texture: Painted to match wall color.
- B. Surface-Mounted, Metal Corner Guards CG-1: Fabricated as one piece from formed or extruded metal with formed edges; with 90 degree turn to match wall condition.
1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [Construction Specialties, Inc.](#)
    - b. [Koroseal Interior Products, LLC.](#)
    - c. [inpro Corporation.](#)
  2. Material: Stainless-steel sheet, Type 304.
    - a. Thickness: Minimum **0.0625 inch (1.6 mm)**.
    - b. Finish: Directional satin, No. 4.
  3. Wing Size: Nominal **2 by 2 inches (50.8 by 50.8 mm)**.
  4. Corner Radius: **1/8 inch (3 mm)**.
  5. Mounting: Adhesive.

## 2.4 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. (800 J/m) of notch when tested according to ASTM D256, Test Method A.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by protection product manufacturer.

## 2.5 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than **20 feet (6.1 m)**, splice aluminum retainers and plastic covers at different locations along the run, but no closer than **12 inches (305 mm)** apart.
3. Adjust end and top caps as required to ensure tight seams.

### 3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Public-use washroom accessories.
2. Custodial accessories.

#### 1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

##### B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

##### C. Delegated Design Submittal: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

#### 1.4 INFORMATIONAL SUBMITTALS

##### A. Sample Warranty: For manufacturer's special warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

## 1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 OWNER-FURNISHED MATERIALS

- A. Owner-Furnished Materials:
  - 1. SD – Soap Dispenser
  - 2. PTD – Paper Towel Dispenser
  - 3. TTD – Toilet Tissue Dispenser

### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
  - 1. Grab Bars: Installed units are able to resist **250 lbf (1112 N)** concentrated load applied in any direction and at any point.

### 2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.
- B. Grab Bar **GB**:
  - 1. Mounting: Flanges with concealed fasteners.
  - 2. Material: Stainless steel, **0.05 inch (1.3 mm)** thick.
    - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
  - 3. Outside Diameter: **1-1/2 inches (38 mm)**.
  - 4. Configuration and Length: As indicated on Drawings.
- C. Sanitary-Napkin Disposal Unit ND:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Bobrick Washroom Equipment, Inc.](#)
  - b. [Bradley Corporation.](#)
  - c. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.](#)
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

D. Mirror Unit MI:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Bobrick Washroom Equipment, Inc.](#)
  - b. [Bradley Corporation.](#)
  - c. [Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.](#)
2. Frame: Stainless steel angle, **0.05 inch (1.3 mm)** thick.
  - a. Corners: Manufacturer's standard.
3. Size: As indicated on Drawings.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

E. Hook:

1. Description: Single-prong unit .
2. Mounting: Exposed.
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 7 finish (polished).

## 2.4 CUSTODIAL ACCESSORIES

A. Custodial Mop and Broom Holder MBH:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
2. Length: **36 inches (914 mm)**.
3. Hooks: Four.
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
  - a. Shelf: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel.
  - b. Rod: Approximately **1/4-inch- (6-mm-)** diameter stainless steel.

## 2.5 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, ~~0.031-inch-~~ (0.8-mm-) minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), ~~0.036-inch-~~ (0.9-mm-) minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A653/A653M, with ~~G60~~ (Z180) hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

## 2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 2 keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
  - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

## SECTION 104416 - FIRE EXTINGUISHERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

#### 1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
- b. Faulty operation of valves or release levers.



2. Warranty Period: Six years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  1. Provide fire extinguishers approved, listed, and labeled by FM Global.

### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Activar Construction Products Group, Inc. - JL Industries.
    - b. Babcock-Davis.
    - c. Larsens Manufacturing Company.
    - d. Nystrom.
    - e. Potter Roemer LLC; a Division of Morris Group International.
  2. Valves: Manufacturer's standard.
  3. Handles and Levers: Manufacturer's standard.
  4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container FE: UL-rated 10-A:120-B:C, **20-lb (9.1-kg)** nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

### 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
  1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
  - a. Orientation: Vertical.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
  1. Mounting Height: Top of fire extinguisher to be at 42 inches (1067 mm) above finished floor.

END OF SECTION 104416

## SECTION 10 73 00 - ALUMINUM WALKWAY COVERS

### 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. Related Sections include the following: Design, fabrication, and installation of welded extruded aluminum walkway cover systems. Walkway and Canopy System notation is used interchangeably in the documents.
- B. Products Furnished but not Installed Under this Section: Column sleeves (styrofoam blockouts) or anchor bolts (if required)

#### 1.3 REFERENCES

- A. The Aluminum Association (AA):
  - 1. The Aluminum Design Manual, Specifications & Guidelines for Aluminum Structures.
- B. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
- C. American Society of Civil Engineers (ASCE):
  - 1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
  - 1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
  - 2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 3. ASTM C 150, Specification for Portland Cement.
  - 4. ASTM C 404, Specification for Aggregates for Masonry Grout.
- E. American Welding Society (AWS):
  - 1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Design Requirements:
  - 1. Design Walkways and canopies in accordance with The Aluminum Design Manual.
  - 2. Comply with the wind requirements of 2018 International Building Code (IBC) and ASCE 7-02.

3. Provide an all welded extruded aluminum system. Non-welded systems are not acceptable.
  4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.
- B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
1. Structural loads.
  2. Thermal movements.
  3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
  4. Dimensional tolerances of building frame and other adjacent construction.
  5. Failure includes the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferred to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    - d. Noise or vibration created by wind and thermal and structural movements.
    - e. Loosening or weakening of fasteners, attachments, and other components.
    - f. Sealant failure.
- C. Structural Loads:
1. Wind Load Criteria: As indicated on Drawings.
  2. Seismic Load Criteria: As indicated on Drawings.
  3. Structure shall be capable of supporting a concentrated load, such as being walked upon.
- D. Grout: Compressive strength of 3000 psi, minimum.
- E. Sizes on drawings are considered to be minimum.
- 1.5 SUBMITTALS
- A. Product Data: Manufacturer's product information, specifications, and installation instructions for walkway cover components and accessories.
- B. Shop Drawings: Include plan dimensions, elevations, details, and reactions for foundation design.
- C. Samples:
1. 3-inch-square samples of each finish selected on the substrate specified.
- D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in South Carolina. Design calculations shall state that the walkway cover system and canopies design complies with the wind and seismic requirements of 2018 IBC and ASCE 7-02, the stability criteria of applicable building code, and all other governing criteria.

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least ten years experience in the design, fabrication, and erection of extruded aluminum walkway cover systems.
- B. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
  - 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
  - 2. Walkway covers shall be installed by the manufacturer; third party installation is not acceptable
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."
- E. Testing Agency Qualifications: Minimum ICC certified.
- F. DELIVERY AND STORAGE
  - 1. Deliver and store all items in protected areas. Keep free of any damage. Replace any damaged items or parts at no cost to the Owner.

## 1.8 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period. Intention of Warranty is the manufacturer will come to the job site and do all necessary to remedy deficiencies.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Deterioration of metals and other materials beyond normal weathering.
    - c. Adhesive or cohesive sealant failures.
    - d. Water leakage through roof system.
    - e. Failure of operating components to function properly.
  2. Warranty Period: 2 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide East Coast TVM or a comparable product.
1. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures.
  2. Peachtree Protective Covers, Inc.

### 2.2 MATERIALS

- A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.
- B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel. (rivets not permitted in deck)
- C. Gaskets: Dry seal santoprene pressure type.
- D. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

### 2.3 FABRICATION

- A. General:
1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
  2. Welding: In accordance with ANSI/AWS D1.2.
  3. Column and Beam Construction: Make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds

only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints may be used only if fully welded units cannot be shipped on local, state, or federal highways without a special permit from the department of transportation.

4. Deck Construction: Fabricate from 3" x 6" flat seam decking with snap connectors by canopy manufacturer. The fastenings must have minimum shear strength of 350 pounds each. Assemble deck with sufficient camber to offset dead load deflection.
  5. Exposed welded structural connections shall be painted subsequent to the welding. Using air-dry touch up paint to cover these locations is not acceptable. A sample shall be submitted prior to proceeding with touch-up paint.
  6. All exposed fasteners shall match adjacent finish. Exposed fasteners and/or exposed fastener plates shall not be located on the vertical plane of the fascia, beams, or columns. Exposed fasteners shall be limited to minimal locations such as the bottom and top of the fascia elements. Location of all exposed fasteners shall be approved by the Architect.
  7. Corner fascia Construction: Where the canopy fascia is exposed on two or more adjacent corners corners shall be constructed with a clean, hairline miter joint in the profile of the fascia, or a corner cover trim piece (minimum of 6" length in each direction) shall be installed with fasteners only visible on the top and bottom horizontal planes (no fasteners permitted on the fascia). The trim piece shall follow the profile of the fascia.
  8. Exposed ends of beams, columns or structural elements: All exposed ends of beams columns or structural elements shall be capped with an endplate welded on all sides and finished to match adjacent surfaces.
- B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage. Coordinate invert elevations for drain cutouts assuring positive drainage for tie-in to underground storm drainage system. Circular downspout opening in column not acceptable.
- C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner. Provide structural ties in tops of all beams.
- D. Deck: Extruded self-flashing sections interlocking into a composite unit. Provide welded plate closures at deck ends.
- E. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.
- F. Flashing shall be minimum .032 aluminum to match adjacent material color.
- G. Factory Finishing: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.
1. High performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
  2. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride

resin by weight; complying with AAMA 2605. Color: to match existing canopy system on campus

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verification of Conditions: Verify that all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

#### 3.2 ERECTION

- A. Erect protective cover true to line, level, and plumb. Protect aluminum columns embedded in concrete or earth with clear acrylic. Fill downspout columns with grout to the discharge level to prevent standing water. Assure that grout fills all voids and “keys” to columns. Coordinate the work with other trades and set column drainage cutouts at proper elevation for connection with underground storm drainage piping. Install weep holes at top of concrete in non-draining columns to remove condensation.
- B. Install roof deck sections, accessories and related flashing in accordance with manufacturer’s instructions. Provide roof slope for positive storm water drainage without ponding water. Align and anchor roof deck units to structural support frames.
  - 1. Roof fasteners shall be evenly spaced and aligned in straight lines.
- C. Provide hairline miters and fitted joints.
- D. Install sealant at all penetrations in deck, beam or columns of canopy system to maintain watertight system.
- E. Structural members and anchors shall be anchored to CMU grouted solid. Elements and supports shall not anchor to brick veneer.

#### 3.3 CLEANING AND PROTECTION

- A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.
- B. Cleaning: Remove protective coverings at time in project sequence which will afford greatest protection of work. Clean finish surfaces as recommended by manufacturer. Maintain in a clean condition during construction.
- C. Protect materials during and after installation.



3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements. Inspect Work for conformance of canopy structure, connections and roof deck connections with the approved shop drawings.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Testing includes soils and concrete footings.

END OF SECTION 10 73 00

## SECTION 220500 - GENERAL PLUMBING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. The Plumbing Work shall include, but not be limited to, the following:
  - 1. Soil and waste and vent systems
  - 2. Domestic water systems
  - 3. Domestic water heating
  - 4. Plumbing fixtures and trim
  - 5. Pumps for plumbing systems
  - 6. Gas piping systems
  - 7. Compressed air system

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 DELINEATION OF WORK:

- A. Provide all necessary supervision and coordination of information to installers who are performing work to accommodate Division 22 installations.
- B. Where the Division 22 installer is required to install items which they do not purchase, they shall include for such items:
  - 1. The coordination of their delivery.
  - 2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
  - 3. Their safe handling and field storage up to the time of permanent placement in the project.
  - 4. The correction of any damage, defacement or corrosion to which they may have been subjected.

5. Their field assembly and internal connection as may be necessary for their proper operation.
  6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
  7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
- C. Items which are to be installed by the Division 22 installer but not purchased as part of the work of Division 22 shall be carefully examined upon delivery to the project. The Division 22 installer shall provide all work necessary to properly install these items.
- D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the A/E shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the A/E.

#### 1.4 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.
- B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- C. All equipment of one type (such as pumps, valves, etc.) shall be the products of one manufacturer unless specifically stated otherwise.
- D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
- E. All materials with a manufacturers listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.
- B. All work shall conform to the following Building Codes (latest edition):
  - 1. International Building Codes
  - 2. National Fire Protection Association
- C. All work shall conform to all federal, state, and local ordinances.
- D. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:
  - 1. Factory Mutual Laboratories (FM)
  - 2. Underwriters Laboratories, Inc. (UL)
- E. All fuel fired equipment shall meet the requirements of the insurers and agencies listed and also meet the owner's insurer requirements.

1.6 STANDARDS AND PROCEDURES:

- A. All work shall meet or exceed the standards and procedures of the following:
  - 1. AGA: American Gas Association
  - 2. ANSI: American National Standards Institute
  - 3. API: American Petroleum Institute
  - 4. ASME: American Society of Mechanical Engineers
  - 5. ASTM: American Society of Testing and Materials
  - 6. AWWA: American Water Works Association
  - 7. IBR: Institute of Boiler and Radiator Manufacturers
  - 8. MSS: Manufacturers Standardization Society
  - 9. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors
  - 10. NEMA: National Electrical Manufacturer's Association
  - 11. OSHA: Occupational Safety & Health Administration
  - 12. IRM: Improved Risk Mutuals

1.7 APPROVAL OF SUBSTITUTIONS:

- A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the A/E shall be final and bind all parties concerned.
- B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to bid opening date to the A/E. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.
- C. Approval of the A/E to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.
- D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the A/E, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS:

- A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.
- B. Notify the A/E of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.9 EQUIPMENT CONNECTIONS:

- A. The contract documents may indicate specific electrical, duct, and piping connection locations to equipment. Each manufacturer approved for bidding may have different connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.

B. The Contractor shall bear all costs for required changes in connection to equipment.

1.10 WORKMANSHIP:

A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.

B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on job site and submit others for approval when required.

1.11 GUARANTEES AND WARRANTIES:

A. General:

1. Furnish to the A/E a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.

B. Equipment Warranties:

1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at his option, may permit the contractor to provide the required repairs on the equipment.
2. The equipment manufacturer shall include a written guarantee with the closeout documentation.

C. Duration Period:

1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.

D. Extended Warranties:

1. Warranty periods shall be extended where specifically stated in these specifications.
2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
3. The extended warranty time listed is time in addition to the base warranty period.

4. The following systems or equipment shall have extended warranties:
  - a. Variable frequency drives shall have a one year extended warranty.

E. Non-Warranted Items:

1. Non durable replaceable items do not require replacement after the date of acceptance.

F. Warranty Repair:

1. Repair shall take place as soon as possible but not later than the following:
  - a. Items not essential for facility operation - 7 days.
  - b. Items that have a small impact on facility operation - 2 days.
  - c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.
2. The determination of the impact on the facility is solely that of the Owner and A/E.
3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
5. All costs associated with warranty work shall be borne by the contractor.

1.12 EXISTING FACILITIES:

- A. The location of duct, pipe, fixtures, equipment and appurtenances for existing facilities are shown on plans to indicate the extent of work required. Exact condition shall be field verified.
- B. Work shall be performed above existing ceilings except where removal of existing ceilings is specifically identified. Where working above existing ceilings, remove existing tile/grid and reinstall existing tile/grid as necessary. Any damaged tile/grid shall be replaced at the Contractor's expense.

PART 2 - PRODUCTS: (NOT USED)

PART 3 - EXECUTION:

3.1 PRIOR CONDITIONS:

- A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.
- B. If the prior work does not make a proper installation of any equipment or system component possible, notify the A/E prior to installation of any equipment or system component.

3.2 INSTALLATION:

- A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.
- B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the A/E in writing prior to installation of equipment.
- C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the A/E in writing prior to installation of the system component.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT:

- A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the A/E, at no cost to the Owner.
- B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.
- C. Piping shall be protected by storing it on elevated supports and capping the ends.
- D. During construction, all open ends of pipe, floor drains, etc. which could collect construction debris shall be properly capped.

3.4 CLEANING OF SYSTEMS AND EQUIPMENT:

- A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.
- B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.
- C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.



3.5 SUPPORT OF SYSTEMS:

- A. Hanging piping or equipment from un-reinforced metal roof decks (i.e., metal roof deck w/o concrete is not permitted).
- B. The following methods of support are not permitted:
  - 1. Wire hangers unless specifically indicated
  - 2. Perforated straps

END OF SECTION 220500

## SECTION 22 0501 - COMMON PLUMBING MATERIALS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the plumbing systems where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
  1. AISC Steel Handbook
- B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.
- C. Manufacturers:
  1. The following paint manufacturers are acceptable:
    - a. Glidden
    - b. Sherwin-Williams
    - c. Devoe Paints
  2. The following caulking manufacturers are acceptable:
    - a. TREMCO
    - b. Sonneborn - Contech
    - c. W. R. Meadows

## PART 2 - PRODUCTS

### 2.1 PAINT:

#### A. General:

1. Painting shall be in strict accordance with the paint manufacturer with regards to surface preparation, priming, and finish painting.
2. High temperature paint, chemical resistant paint, and similar special paints shall be provided as required for specific application.
3. Color shall be as selected by A/E. Color can be any available color from manufacturer.
4. In addition to prime coat, two finish coats shall be applied.
5. Refer to Section 22 0553 "Identification for Plumbing Piping and Equipment" for additional materials to be painted.

#### B. The following items shall not be painted unless specifically specified otherwise:

1. Concealed Supports and Accessories
2. Hot Dipped Galvanized Steel
3. Stainless Steel
4. Aluminum
5. Threaded Rods
6. Factory Painted Items

#### C. In addition to equipment and materials specified elsewhere to be painted, the following shall be painted (except where excluded elsewhere in this section of specifications):

1. All hangers, non-threaded rods, fasteners, supports, and accessories where not located in concealed locations.
2. Flues on the exterior of the building.

#### D. Paint shall be:

1. Glidden Industrial Enamel
2. Sherwin-Williams Industrial Enamel
3. Devco Paints Industrial Enamel

E. PVC Jacket:

1. When PVC jacket is specified to be painted, the jacket shall be primed with a plastic primer by Rustoleum.

2.2 FLASHING:

A. General:

1. Provide flashing and counter flashing on all pipes, flues, and other plumbing system components which penetrate exterior walls or roofs.
2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. Plumbing Pipe:

1. See detail on plans.

2.3 HOUSEKEEPING PADS:

A. General:

1. Housekeeping pads shall be constructed of concrete and shall meet the requirements of the Concrete specifications.
2. Concrete shall develop a minimum strength 3000 psi at 28 days or as specified in the concrete specification, whichever requirement is greater.
3. Housekeeping pads shall extend six inches past equipment and supports in all direction.

B. Pads (exterior):

1. All equipment installed on grade and on the exterior of buildings shall be provided with a reinforced concrete housekeeping pad.
2. Pad shall be minimum six inches thick and four inches above finished grade.

2.4 MARKING (UNDERGROUND PIPE):

A. All underground gas, and plumbing piping shall be marked.

- B. Provide detectable aluminum plastic or backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried utility piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3" minimum width, color coded and with warning and identification imprinted in bold black

letters continuously and repeatedly over entire length. Use permanent code and letter coloring unaffected by moisture or other substance contained in trench backfill material.

2.5 DRAINS AND DRAIN PANS:

A. General:

1. Drain shall be full size of connections, size indicated on drawings, or 3/4" minimum, whichever is largest.

B. Auxiliary Drain Pans:

1. All storage tank type water heaters shall be provided with auxiliary drain pans.

C. Drain Pans (Over Electrical Equipment):

1. Provide 20 gauge galvanized drain pan with drain connection under all pipe located within three feet horizontally of any electrical panels, switchboards, or transformers.
2. Drain pan shall have soldered or welded corners and shall be 2" deep and extend 12" past pipe and 36" beyond electrical equipment.

2.6 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.
- B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.7 FASTENERS, ANCHORS, AND ACCESSORIES:

- A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic.
- B. Materials provided shall be considered industry standard for commercial or industrial use.
- C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.
- D. Materials installed outdoors, in attics, in crawl spaces, in tunnels and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.
- E. Unless otherwise specified or required by the manufacturer, bolts shall meet or exceed the following strengths:
  1. Proof Load: 74 ksi

2. Yield Strength: 81 ksi
3. Tensile Strength: 105 ksi

2.8 SEALANT:

- A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.
- B. Color shall be approved by A/E.

PART 3 - EXECUTION

3.1 FLASHING:

3.2 EQUIPMENT INSTALLATION:

- A. Submit to the A/E a detailed description and sketches indicating the method of transporting heavy equipment within the building to its final installed location.
- B. The submittal shall indicate maximum point loading on the structure, method to distribute load, and shoring of structure.

3.3 PAINTING:

- A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.
- B. All conditions that prohibit proper application of paint shall be reported in writing to the A/E.
- C. Submit manufacturer of paint, type, and paint color samples to the A/E for review.

3.4 EQUIPMENT STORAGE:

- A. Facilities for storing materials and equipment shall be provided by the Contractor.
- B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.
- C. All stored items shall be elevated off slab or grade.

3.5 HOUSEKEEPING PADS:

- A. All concrete housekeeping pads shall be properly coordinated with construction of floors and other building work. All exposed surfaces shall be steel troweled smooth with beveled edges. Bond foundations to floor unless otherwise indicated. Pad shall be level within 1/16 inch for the length and width of the pad.
- B. Reinforce concrete with 4 inch by 4 inch wire mesh, No. 6 gauge, unless specified otherwise.
- C. Provide all required foundation bolts, washers, sleeves, plates, templates, etc., for mechanical equipment. Foundation bolts shall be embedded in concrete, set in place before concrete is poured and securely held in place with templates.
- D. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, and all required hanger bolts and other appurtenances necessary for the proper installation of this equipment. All such work shall be shown in detail on the shop drawings, showing the complete details of all foundations including necessary concrete and steel work, fasteners and vibration isolation devices.
- E. Set all equipment on their foundations and shim level with steel shims and grout up under base for uniform bearing.
- F. Equipment shall be fastened to housekeeping pads as required by seismic design.
- G. Housekeeping pad shall be fastened to structural slab as required by seismic design or as indicated by structural or mechanical details, whichever requirement is greater.

3.6 MARKING (UNDERGROUND PIPING):

- A. Bury tape with the printed side up at a depth of 12" below the top surface of earth or 12" below the top surface of subgrade below pavements.

3.7 DRAINS AND DRAIN PANS:

- A. General:
  - 1. All horizontal drain piping shall be installed with a uniform grade of not less than 1/8" per foot of fall in direction of flow except as noted otherwise.
  - 2. All drain lines installed at floor in mechanical rooms shall be supported by threaded rods and pipe clamps. Rod shall be anchored into the floor slab.
- B. Equipment and Miscellaneous Drains:
  - 1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

C. Auxiliary Drain Pan:

1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

3.8 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Run vents and reliefs to location indicated on plans or, if none indicated, to a location where they can discharge safely without presenting a hazard to personnel. Terminate with appropriate fitting.
- B. Run overflow similar to drain.

3.9 EXTERIOR SEALANT:

- A. Submit color charts to A/E.

3.10 EQUIPMENT PENETRATIONS:

- A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.11 EQUIPMENT INSTALLATION:

- A. Repair all insulation damaged during installation of equipment.

3.12 EQUIPMENT ATTACHMENT:

- A. Equipment shall be secured to the building or structure. Where equipment is provided with a method of attachment, they shall be used to attach the equipment. Where equipment is not provided with a method of attachment, the contractor shall add gussets, angles, or similar material to the unit without affecting the performance or warranty of the equipment, which shall be used to attach the equipment.

END OF SECTION 22 0501



## SECTION 220503 - DEMOLITION, PATCHING AND REPAIR

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the demolition of all plumbing equipment, piping, and appurtenances where shown on the drawings and specified hereinafter.
2. Furnish all labor, materials, tools and equipment and perform all operations in connection with the patching and repair of building structure, finishes and building assemblies as specified hereinafter.
3. All existing utilities, water, etc. shall be reconnected to new systems as required to maintain the same functions as existed prior to new work.

##### B. Descriptions:

1. Cut openings thru the existing building walls, roof, floors, and finishes to accommodate the installation of Division 22 equipment, controls, piping, and appurtenances.
2. Remove and dispose of existing plumbing equipment, piping, and appurtenances.
3. Patch and repair all building finishes, structural components, or other appurtenances that are removed or damaged as a result of the performance of this contract. Patch and repair work shall include finishes, components, substructure and materials required for the installation of such work in accordance with standard practices.
4. All penetrations thru exterior walls, floors, and roof systems shall be sealed watertight.
5. Patched and repaired work shall be finished to match existing or adjacent construction and conditions.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

## PART 2 - EXECUTION

### 2.1 GENERAL:

- A. Beams, columns and other load bearing structures shall not be drilled, cut, or otherwise modified without written approval by structural engineer.

### 2.2 PROTECTION:

- A. Provide barricades and take all other precautionary measures necessary to protect personnel and property.
- B. The Contractor shall be responsible for any damages to adjacent areas to the construction area.
- C. Areas not included in the scope of work, areas where work is minimal, and, in the case of a phased contract, areas which remain inactive for long periods shall be protected from the area in which the work is being performed by a slab to slab barrier acceptable to engineer and local authorities.
- D. Protect the roof at all times. Provide planking, plywood, supports, and other materials and means to ensure damage is not incurred.
- E. At no time shall required means of egress be blocked by equipment materials, permanent or temporary barriers.

### 2.3 COORDINATION:

- A. All demolition work shall be coordinated with the Owner. Work which will interrupt building utilities or cause the disruption of the normal environment in areas of the building not within the scope of this project will be performed at other than the Owner's normal working hours.

### 2.4 PIPE PENETRATIONS:

- A. All pipe penetrations shall be core drilled. All other penetrations shall be saw cut. Openings shall not be larger than required for proper installation of pipe.

### 2.5 MATERIAL REMOVAL:

- A. The Owner shall retain first right of refusal on all existing equipment, piping, and appurtenances which are to be removed as a result of this contract.
- B. Coordinate demolition work with Owner using extreme care not to damage existing equipment which Owner elects to retain.
- C. Remove Owner retained equipment from existing location and store equipment at a location on the site where specified by Owner.

- D. All material, equipment, supports, and appurtenances not required as the result of demolition to or renovation of the building systems shall be removed from the project site and disposed of properly unless retained by Owner.

END OF SECTION 220503

## SECTION 220505 - TRENCHING AND EXCAVATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the trenching and excavation of grade required for the installation of pipe, conduit, and other below grade systems where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 221100.1 – Underground Pipe Coating

#### 1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
  1. OSHA
  2. ASTM D698

### PART 2 - EXECUTION

#### 2.1 TRENCH EXCAVATION:

- A. Trench excavation shall be open cut to the depth required and shall be kept free of water using well points if required. Trenches will be sheeted and braced as soil conditions indicate and required by the Occupational Safety and Health Act. Such sheeting shall be removed after backfilling has progressed to a stage that no damage to pipe lines or structures will result from its removal.
- B. When rock excavation is encountered at grade in trenches, the trench shall be excavated not less than six (6) inches below the bottom of the pipe bell, refilled with gravel or crushed stone, thoroughly tamped in place, and shaped to the pipe as heretofore specified.

- C. Excavated rock shall not be mixed with material selected for tamped backfilling under and around the pipe up to a level at least one (1) foot above the pipe.
- D. If in the opinion of the A/E the material excavated is objectionable, the Contractor shall be required to remove and properly dispose of the excavated material and provide acceptable fill material.

## 2.2 PREPARATION OF FOUNDATION FOR PIPE LAYING:

- A. Width of trenches at any point below top of pipe shall not be greater than outside diameter of pipe plus 16 inches for pipes measuring up to 30 inches, and 24 inches for pipe measuring greater than 30 inches, to permit satisfactory jointing and thorough tamping of bedding material under and around pipe.
- B. When the excavation is in firm earth, care shall be taken to avoid excavation below the established grade. If this should occur, the area so excavated shall be backfilled in two-inch lifts thoroughly compacted with mechanical tampers or with granular fill. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints and as hereinafter specified. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depression shall be only of such length, depth, and width as required for properly making the particular type of joint.
- C. Where unstable earth or muck is encountered in the excavation, a minimum of 6" below grade will be removed and backfilled with stone, sand or other suitable material to give a stable subgrade.

## 2.3 BACKFILLING:

- A. Backfill for trenches shall be suitable earth free of rocks, large roots, excessive sod, broken pavements, or other objectionable foreign matter. Backfill shall first be carefully hand tamped under and around the pipe and then thoroughly compacted by mechanical tampers in layers not over 8" in loose depth. Top of the backfill shall be carried above the surrounding grade so that upon subsequent settlement, the backfill will be at proper elevation. In all cases mechanical tamping must be carried evenly on both sides of the pipe to the top of the excavation. All pipe that has its line or grade disturbed, or becomes defective in any other manner whatsoever, shall be removed and replaced at the Contractor's expense.
- B. All backfill material shall be compacted to a density equal to 95% of the Standard Proctor maximum dry density as defined by ASTM D698. The Contractor may add moisture or dry the backfill material as required.
- C. Compaction shall be done in such a way so that the equipment is not used directly over the pipe until sufficient backfill has been placed so that the equipment will not have a damaging effect on the pipe.

2.4 STONE STABILIZATION:

- A. When trench conditions or the bottoms of excavations for structures are such as to require stabilization of the bed, the Contractor shall remove the unstable material in the excavation and replace it with stabilizer material. Stabilizer material shall be either stone having a maximum size of 3/4", or other hard, durable material obtained from local sources and approved by the A/E.

2.5 PIPE LAYING:

- A. Proper implement tools and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of the work. All pipe, fittings, valves and specials shall be carefully lowered into the trench, piece by piece, by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to the water line materials and protective coating and linings. Under no circumstances shall water line materials be dropped or dumped into the trench.
- B. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged, or unsound pipe shall be rejected. If any defective piece shall be discovered after having been laid, it shall be removed and replaced with sound ones at the Contractor's expense. All pipes and fittings shall be thoroughly cleaned before they are laid, and shall be kept clean until accepted in the completed work.
- C. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint. Pipe ends shall not be left open such as at the end of a day's work or during temporary suspension of construction, but shall be securely covered to prevent the entry of foreign matter or small animals. Kinks or sharp bends giving excessive deflection or which put pipe joints in strain will not be permitted. Horizontal and vertical curvature, where fittings are not specified, can be obtained by cutting pipe to short lengths.
- D. When cutting short lengths of pipe, pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe.
- E. Thrust blocking, pads, straps and clamp, and rod assemblies shall be provided at fittings, valves, and changes of direction.
- F. Clamps, rods, straps, nuts, and bolts shall be coated with coal tar enamel after assembly and installation.
- G. All underground water piping shall have a minimum depth of cover of at least 30 inches.

2.6 SEPARATION:

- A. Water and sewer pipes shall be separated by not less than five (5) feet of undisturbed or compacted earth.

1. Exceptions:

- a. The required separation distance shall not apply where the bottom of the water pipe within five feet of the sewer pipe is not less than twelve inches above the top of the highest point of the sewer pipe. The water pipe is permitted to be located in the same trench with the sewer pipe.
- b. The required separation distance shall not apply where a water line crosses a sewer line, provided the water line is sleeved to a point not less than five feet horizontally from the sewer pipe centerline on both sides of such crossing.

2.7 SHEETING, SHORING, AND BRACING:

- A. Furnish and install all sheeting, shoring, and bracing required for the protection of trench and structure excavations, existing structures, and utilities including such temporary sheeting as may be required by the Contractor's operation not specifically shown or specified.
- B. Sheeting, shoring, and bracing shall meet the requirements of the following standard publications.
  1. AASHTO M 168 Standard specifications for structural timber, lumber and piling.
  2. ASTM D 390 Specification for coal-tar creosote for the preservation treatment of piles, poles, and timbers for land and fresh water use.
  3. ASTM D 1760 Specification for pressure treatment of timber products.

2.8 CLEARING:

- A. Perform all clearing work required for the installation of the complete work. Clearing shall consist of the removal and disposal of all trees, stumps, roots, brush, or debris in the way of the work and the disposal of such items at an approved landfill.

2.9 UNLOADING MATERIALS:

- A. Pipe, fittings, and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the cement lining in pipe and fittings. Pipe shall not be unloaded by rolling or dropping off of trucks or cars, but shall be handled by carefully lifting and lowering into position using approved slings or clamps which shall be provided for the purpose.

2.10 SIGNS, BARRICADES, ETC.:

- A. Furnish and install all necessary and required signs, barricades, flagmen, protection devices, etc. as required to protect persons and to protect the materials and services provided under this contract.

2.11 CARE OF EXISTING UTILITIES:

- A. The general location of buried utilities and structures has been indicated on the plans from the best information available. The locations shown on the plans do not imply a guarantee of their accuracy or completeness.
- B. It is the Contractor's responsibility to accurately locate all utilities, structures, and appurtenances in the field. Make all arrangements and liaisons with the utility companies concerned to mark their lines, structures, and appurtenances by coded symbols on the pavement or marked stakes for flags.

END OF SECTION 220505



## SECTION 220510 - DOCUMENTATION AND CLOSEOUT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the project documentation and closeout.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. All reports, forms, and manuals shall be submitted to the A/E in triplicate unless additional copies are noted.
- B. Report, forms, and manuals are to be submitted as soon as possible, but no later than thirty (30) days after the earliest date they can be prepared.

#### 3.2 OWNER TRAINING:

- A. The contractor shall schedule the training on equipment and systems at least 21 days before training is to take place. The contractor shall provide multiple dates and times for the training to allow the Owner to coordinate the schedules of their staff to be trained.
- B. The contractor shall provide all training aids, manuals, etc. for the Owner's staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.
- C. The person providing the training shall be thoroughly knowledgeable in the subject matter.

3.3 PROJECT JOB DRAWINGS AND AS-BUILT DRAWINGS:

- A. Keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, material, and equipment on the project job drawings.
- B. At the time of final inspection, one corrected set of prints shall be delivered to the A/E. All drawing costs to be by the Contractor.
- C. As built drawings shall have the information transferred from the project job drawings including all addendum, supplemental instructions, change orders, and similar information.
- D. Qualified draftsmen shall perform this task.

3.4 OPERATING AND MAINTENANCE MANUALS:

- A. Compile and bind three (3) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. Provide a PDF of this information on a CD.
- B. Binder shall be hard cover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2".
- C. The spine of the binder shall be titled "Plumbing Operating and Maintenance Manual," with the name of the project and the date under the title.
- D. Where laminated documents are required, only one set shall be provided.
- E. The Operating and Maintenance Manual shall include the following:
  - 1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and phone numbers.
  - 2. List name, address and phone number of organization responsible for warranty work, if other than Contractor, and the specific work for which he is responsible.
  - 3. List name, address and phone number of the nearest sales and the nearest service organization for each product.
  - 4. Schedules of all equipment including identification tag numbers shown on plans cross referenced to field applied identification tag numbers.
  - 5. Performance Curves: For pumps, balance valves, and similar equipment at the operating conditions.
  - 6. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.

7. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
  8. Instruction Books: May be standard booklets but shall be clearly marked to indicate applicable equipment and characteristics.
  9. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.
  10. Schedule identifying valve type, size, service, and general location.
  11. Ceiling marker schedule.
  12. All factory test reports where factory tests specified.
  13. All start-up reports.
- F. The following diagrams, schematics, and lists shall be laminated 8-1/2" x 11" as needed for clarity:
1. Valve tag list and schematic

### 3.5 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS:

- A. The A/E will review the Contractor's work periodically throughout the project. A report will be submitted to the Contractor.
- B. The reports shall be responded to within ten days of receipt by the Contractor. Each item shall be addressed with comments written on the inspection report if possible. Contractor's response shall address the status of each item and all discrepancies.

### 3.6 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. After all final tests and adjustments have been completed, the Owner's Representatives shall be instructed in all details of operation and maintenance for the systems installed.
- B. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.
- C. Fifty percent of instructions shall be in a formal classroom setting.
- D. Instruction shall be provided as follows:
  1. Equipment: Trained factory representative
  2. System: Competent employee of the Contractor

3.7 ACCEPTANCE:

- A. Upon notification by the Contractor and after completion of Operation and Maintenance Instructions, the A/E will visit the project for a demonstration of the building system and an inspection of the completed work.
- B. Items which do not comply with the Contract Documents or which function incorrectly will be listed. The list will be provided by the A/E to the Contractor for correction of the installed work.
- C. After all corrections have been made, the Contractor shall notify the A/E who will recheck the systems for compliance of all items listed.

PART 4 - STANDARD FORMS

4.1 GENERAL:

- A. All forms shall be completely filled out by the Contractor prior to acceptance of the project by the A/E.

4.2 PLUMBING CLOSEOUT LIST:

PLUMBING CLOSEOUT DOCUMENT			
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation			
BGA PROJECT NO.: 21105			
DOCUMENT	DATE REVIEWED	DATE RETURNED	COMMENTS
Water Quality Report			
Backflow Preventer Test Report			
Plumbing marked-up As-Builts (1 set red lined)			
Factory Test Reports			
Equipment Start-Up Reports			
Piping Start-Up Reports			
Valve Tag List			
Punchlist dated			
Punchlist dated			
Punchlist dated			
Walk-Through with Owner			
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.			

4.3 PLUMBING INSTRUCTIONS TO OWNER:

PLUMBING INSTRUCTIONS TO OWNER					
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation					
BGA PROJECT NO.: 21105					
INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Plumbing General					
<p>NOTE: Not all instructions may be listed. See other sections of specifications for additional requirements. Up to 8 sets of training material required. Provide per number of persons indicated. Where no minimum specified hours indicated, training shall be provided as necessary for technician to provide the Owner a good understanding of the operation, function, and maintenance requirements of the equipment or system installed.</p>					

4.4 PLUMBING SPARE MATERIALS:

PLUMBING SPARE MATERIALS LIST			
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation			
BGA PROJECT NO.: 21105			
ITEM	DATE DELIVERED	ACCEPTED BY	COPY OF RECEIPT SENT TO BGA
Pump Seals			
Variable Frequency Drives			
Keys for Stops			
Gauges			
Keys			
Tools			
NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.			

4.5 INSTRUCTIONS TO OWNER:

OWNER INSTRUCTIONS SIGN-IN SHEET				
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation				
BGA PROJECT NO.: 21105				
SYSTEM/EQUIPMENT:	DATE	TIME		LOCATION:
		START	FINISH	
INSTRUCTORS (PRINT NAME AND SIGN)				
1. _____				
2. _____				
ATTENDEES (PRINT NAME AND SIGN)				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
WRITTEN MATERIALS PROVIDED TO ALL ATTENDEES: _____ YES _____ NO INSTRUCTIONS IN CLASSROOM: _____ YES _____ NO INSTRUCTIONS IN FIELD: _____ YES _____ NO				



END OF SECTION 220510

## SECTION 220511 - SUBMITTALS

### PART 1 - GENERAL

#### 1.1 GENERAL:

- A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, the more stringent requirements shall apply.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 PREPARATION OF SUBMITTALS:

- A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and material intended for installation. Obtain all drawings and submittals from other trades as necessary to coordinate submittals.
- B. Sign all shop drawings indicating conformance with contract documents before submitting to the A/E.

#### 1.4 SUBMITTALS:

- A. General:
  - 1. Submittals are required on all items of equipment.
  - 2. Submittals shall be bound with an index identifying all types of equipment or system components included. All like items shall be grouped together.
  - 3. Submittals shall include, but not be limited to:
    - a. All requirements of Division 1.
    - b. Complete information pertaining to appurtenances and accessories
    - c. Information properly marked with service or function identification as related to the project.

- d. Where the submittal consists of catalog sheets displaying other items which are not applicable, the proper features shall be clearly identified.
- e. External connections properly marked, as related to the specific use intended, on standard factory assembly and field installation drawings.
- f. All performance characteristics and physical characteristics.
- g. Wiring and control diagram.
- h. All requirements listed in the specific section of specifications.
- i. Electrical data on all motors greater than one horsepower. Data shall include horsepower unit served, power factor, efficiency and product of P.F. x EFF.

B. Field Fabricated Components:

- 1. When field fabricated components are permitted by the specifications, scaled detailed drawings shall be submitted, clearly showing the materials used, dimensions, sizes, and means of assembly. For example, drawings shall be submitted for pump housings (insulation), support stands, etc.

C. Submittal Summary:

- 1. A submittal summary shall be prepared by the contractor within (30) (60) days of project award.
- 2. The summary shall include all products and samples to be submitted along with the date the submittal will be received by the prime contractor.

1.5 SAMPLES:

- A. Samples shall be provided when specified or required by the A/E to check product acceptability or for coordination purposes.
- B. Samples will not be returned and shall not be included in the total required on the project.

1.6 REVIEW OF SUBMITTALS:

- A. Review of shop drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has, in letter form, called attention to such deviations at the time of submission and secured written approval of the specific deviations.
- B. Any materials and equipment listed which are not in accordance with the equipment shown on the schedule shall be of size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Deviation from the characteristics of that

equipment or layout system components will not necessarily be cause for rejection. Review of submittal does not relieve the Contractor of his responsibility. Should an installation not meet the intent of the contract documents, the Contractor may be required by the A/E to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.

- C. It is strongly recommended that the Contractor not purchase or install any equipment or system components prior to receipt of reviewed shop drawings.
- D. Reviewed with notations on the submittal shall not prohibit the Contractor from purchasing equipment. If the Contractor does not comply with the notations, the submittal shall be deemed rejected.

#### 1.7 EQUIPMENT DIMENSIONS AND WEIGHTS:

- A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions for the equipment submitted prior to submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable to the A/E.
- B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted prior to submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the A/E.
- C. Equipment shall not exceed maximum weight indicated on the schedules. If the equipment weight exceeds that indicated on the schedule, even where the manufacturer is an approved manufacturer, that equipment can not be bid on for this project.
- D. If equipment is not acceptable to the A/E due to dimensions or weights exceeding those indicated on contract documents, the Contractor shall accept all responsibility and costs for providing equipment that meets the dimension and weight requirements of the contract documents.

#### 1.8 ELECTRICAL CHARACTERISTICS:

- A. Electrical characteristics for plumbing equipment are generally indicated on the plumbing documents. The electrical documents generally indicate power and wiring requirements to each piece of plumbing equipment.
- B. It shall be the plumbing installer's responsibility to verify prior to submitting shop drawings that the equipment submitted meets the electrical requirements of both the plumbing and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the A/E's attention prior to submitting shop drawings.
- C. If the discrepancy is brought to the A/E's attention prior to ordering the plumbing equipment or electrical materials associated with that equipment, the A/E will issue additional instructions to the Contractor.

- D. If the discrepancy is not brought to the A/E's attention prior to ordering the plumbing equipment and electrical materials (i.e. Contractor does not verify electrical requirements), the Contractor shall be responsible for all costs except those that would have been incurred if the discrepancy was determined prior to ordering the plumbing equipment and electrical materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRODUCT SUBMITTALS:

- A. The following list may be used as a checklist for the contractor and A/E. All products may not be listed.

PRODUCT SUBMITTALS

BGA NO.	PRODUCT	NO.	DATE		STATUS				ITEMS TO RESUBMIT	DATE ITEMS RESUBMITTED
			In	Out	App	AAN	Resub	Rej.		
	Backflow Preventors									
	Balancing Valves									
	Chair Carriers									
	Dielectric Fittings									
	Equipment and Pipe Identification									
	Escutcheons									
	Expansion Tank (Domestic)									
	Firestop Material									
	Fittings and Flange Certificates									
	Flexible Pipe Connections									
	Flues, Stacks, & Vents									
	Gas Trains									
	Hose Bibbs									
	Insulation, Mastics, and Sealants									
	List of Pipe and Fitting Material for Each System									
	No Hub Pipe Clamps									
	Paints									
	Pipe and Pipe Fittings									
	Pipe Expansion Joints and Guides									

BGA NO.	PRODUCT	NO	DATE		STATUS				ITEMS TO RESUBMIT	DATE ITEMS RESUBMITTED
			In	Out	App.	AAN	Resub	Rej.		
	Pipe Hangers and Supports									
	Pipe Shields									
	Pipe Sleeves									
	Plumbing Fixtures									
	Pumps									
	Strainers									
	Temperatures and Pressure Relief Valves									
	Thermometers and Gauges									
	Trap Seal Primers									
	Trap Seal Protection Device									
	Underground Piping System									
	Valves									
	Wall Hydrants									
	Water Heaters									

3.2 TEST AND REPORT SUBMITTALS:

- A. The following list may be used as a checklist for the Contractor and A/E. All tests may not be listed.
1. Plumbing piping.
  2. Gas piping test.
  3. System start-up.

3.3 COORDINATION DRAWING SUBMITTAL:

- A. This section may not include all drawings required. See specific specifications for additional requirements. All drawings shall be drawn (1/8") (1/4") = 1'-0" minimum. Each system shall be represented by a different color.
- B. Review structural and architectural drawings to determine method of attachment or support of pipe and equipment to slabs, walls, and other structural elements.
- C. Coordination Drawings:
1. Provide dimensional coordination drawings of the following:
    - a. Building elements:
      - 1) Walls
      - 2) Casework (built-in)
      - 3) Ceiling
      - 4) Structure (located in ceiling plenum)
    - b. Plumbing elements:
      - 1) Piping and valve
      - 2) Water heaters
      - 3) Other plumbing equipment (with required clearances)
    - c. Other system elements:
      - 1) Lights
      - 2) Cable tray
      - 3) Sprinkler system



- 4) HVAC ductwork and equipment
  - 5) HVAC piping
  - 6) Conduit 1-1/2" and above
2. Drawings shall have the following line weights:
    - a. Building elements and lights – light
    - b. Duct, piping, conduit – medium
    - c. Equipment – heavy
  3. Each system shall be provided with a different color line.
  4. All non-essential text, symbols, objects, etc. (not necessary for systems coordination) shall be omitted from the coordination drawings.
  5. Submit drawings for entire project.
  6. Drawings shall be submitted in color.
- D. Provide dimensional drawings in plan with all site utilities shown.
- E. Provide dimensional drawings on a plan indicating the following:
1. Size and location of all rooftop equipment, equipment weights, and roof penetrations.
  2. Size and location of all concrete housekeeping pads.
  3. Size and location of all slab penetrations.
  4. Size and location of all precast wall penetrations.
  5. Size and location of all prestressed tee penetrations.
- F. All roof penetrations and equipment shall be drawn on approved roof structural plans to coordinate openings with structural elements.
- G. When equipment is to be installed on supports provided by installers other than Division 22, the Division 22 installer shall provide:
1. Size, orientation, weights, and connection locations for all equipment to be installed. Information shall include all seismic components, point loads, elevations, etc.
  2. Location and required size and elevation of all pipe and duct supports.
- 3.4 SHOP DRAWING SUBMITTAL COVER SHEET:
- A. A separate cover sheet shall be submitted with each product type (i.e., valves can be submitted together, etc.).

3.5 **SHOP DRAWING SUBMITTAL COVER SHEET**  
(Provide one page for each group of shop drawings.)

PROJECT NAME: HGTC Diesel Engine Training Facility Interior Renovation BGA FILE NO. 21105-5-33  
OWNER PROJECT NO. \_\_\_\_\_ BGA SHOP DWG. NO. \_\_\_\_\_

PRODUCT: \_\_\_\_\_

**NOTE TO CONTRACTOR**

1. All shop drawing comments by Buford Goff & Associates shall be complied with or the shop drawings shall be declared rejected.
2. If this form is not submitted and signed by the Contractor, the Contractor shall verify that items 1 to 8 below are answered YES or N/A or the shop drawings shall be declared rejected.
3. Valves, plumbing fixtures, etc., are reviewed for characteristics but not for size and quantity. It is the Contractor's responsibility to verify sizes and quantity.

**SHOP DRAWING SUBMITTAL** (Contractor to complete this section)

1. Does the submittal comply with the contract documents?  Yes  No  
If no, list all deviations on an attached page.
2. Have the electrical characteristics (i.e., volt/phase/amps, MOP, MCA, and connection location) been reviewed with the electrical schedules and the electrical circuit sizing meet the requirements of that equipment?  Yes  No  N/A
3. Is product an approved manufacturer listed in the specifications or addendum?  Yes  No  N/A
4. Does the product submitted meet the manufacturer's recommended service clearance for the space in which it is to be installed?  Yes  No  N/A
5. Have the control components of the product been reviewed and do they meet with the requirements of the controls contractor?  Yes  No  N/A
6. Have the equipment connections been reviewed (size and locations) and has the Contractor included all provisions to make the required connections?  Yes  No  N/A
7. Has the seismic engineer reviewed and approved the method of connecting seismic restraints to equipment?  Yes  No  N/A
8. Is the equipment within the weight limitations specified, if any?  Yes  No  N/A

**BGA'S SHOP DRAWING STAMP** (Engineer to complete this section)

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Contractor is responsible for specific compliance with the information given in the Contract Documents; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades, and the safe and satisfactory performance of his work.

- Reviewed  Reviewed as Noted  Revise and Resubmit  Revise and Resubmit Items Indicated  
 See attached for additional comments  Reject

Comments: \_\_\_\_\_

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

END OF SECTION 220511

## SECTION 220517 - SLEEVES, SEALS, AND ESCUTCHEONS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of sleeves, seals, and escutcheons where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 220503 - Demolition, Patching and Repair
  2. Section 221100 – Plumbing Piping

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturers:

1. The following mechanical seal and sleeve manufacturers are acceptable:
  - a. Thunderline Corporation
  - b. Metraflex

### PART 2 - PRODUCTS

#### 2.1 SLEEVES:

##### A. General:

1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs unless specific details indicate otherwise.

B. Type:

1. Sleeves in non-masonry or concrete construction shall be minimum 24 gauge sheet metal.
2. Sleeves in masonry or concrete construction shall be schedule 40 black or galvanized steel.
3. Sleeves in membrane or waterproof construction shall have flashing ring or other method acceptable to the membrane or waterproofing manufacturer.
4. Sleeves provided at floor slabs and support piping weight shall be cast in place and have a minimum of four anchoring tabs.
5. Split sleeves shall be permitted only when approved by the Engineer.

C. Sleeve Sizes:

1. Sleeves for uninsulated piping shall be two pipe sizes larger than pipe passing through or a minimum of 1/2" clearance between inside of sleeve and outside of pipe.
2. Sleeves for insulated piping shall be adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
3. Sleeves for branches off of risers shall be sized as required for insulated or uninsulated pipe and shall also be sized to accommodate expansion of riser.
4. Sleeves for pipe passing through a foundation wall or under a footing shall be two pipe sizes greater than pipe passing through.

D. Sleeve Length:

1. Sleeves shall be equal to the thickness of construction and terminated flush with surfaces.

E. Sleeve Packing:

1. Sleeves shall be packed as follows:
  - a. If not indicated otherwise, seal entire sleeve at exterior wall with silicone caulk.

2.2 ESCUTCHEONS:

A. General:

1. Escutcheons shall be chrome plated brass.
2. Escutcheons shall be held in place by internal spring tension or set screws.

3. Escutcheon plates shall be large enough to completely close hole around pipes and sleeve and shall be square, octagonal or round.

B. Escutcheons shall be located:

1. On all exposed piping through walls, floors, partitions and ceilings except in unoccupied equipment rooms (i.e. boiler rooms and similar spaces).
2. At all piping in casework.

2.3 MECHANICAL SEALS:

A. General:

1. Provide mechanical seals and sleeves at all pipe exiting building below slab and thru wall.
2. All pipe shall have seals and sleeves including but not limited to:
  - a. Domestic water
  - b. Gas piping

B. Sleeves:

1. Sleeves shall be constructed of high impact thermoplastic with water stop and anchor collar.
2. Sleeve shall be of length and size required for each pipe and wall thickness. Basement walls are approximately 30" thick.
3. Sleeve shall be:
  - a. Link Seal Type Century line sleeve model CS
  - b. Metraflex wall sleeve

C. Seal:

1. Seal shall be constructed of interlocking rubber links.
2. Seal shall be:
  - a. Link Seal
  - b. Metraseal

PART 3 - EXECUTION

3.1 GENERAL:

A. Installation:

1. Install sleeve at time of construction of assembly.
2. Sleeve shall be grouted in place with appropriate grout to match construction.
3. Pipe shall be centered to the extent practical in the sleeve.

3.2 MECHANICAL SEAL:

- A. Install short section of capped pipe and test integrity of sleeve as recommended by the manufacturer.

END OF SECTION 220517

## SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of gauges where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturer:

1. The following thermometer, pressure gauge and accessories manufacturers are acceptable:
  - a. Trerice
  - b. Weksler
  - c. Weiss
  - d. MILJOCO

### PART 2 - PRODUCTS

#### 2.1 GENERAL:

- A. Gauges shall be suitable for the environment in which it is to be installed. Gauges installed outside shall be rust-proof and weather-resistant.
- B. Compound gauges shall be provided when both positive pressure and a vacuum can occur.

- C. All gauges shall be equipped with a 1/4" brass ball valve and shall be removable from hydronic and steam systems without loss of medium.
- D. Gauges installed outside shall be nonfreeze type to 0 degrees F.
- E. Gauges shall have extension to extend a minimum of 1" greater than the thickness of the insulation.

## 2.2 THERMOMETERS:

- A. Thermometer shall be provided at all thermometer wells.
- B. Thermometers shall be red reading, non-mercury, adjustable stem, angle type complete with sensing element.
- C. Case shall be aluminum with baked black enamel finish (or molded black nylon glass fiber reinforced). Front shall be plastic. Scale shall be 9" with black numerals on a white background. Case shall be rotatable.
- D. Sensing element shall be brass or aluminum extension, swivel union, and brass separable socket.
- E. Thermometers shall be accurate to within (+) or (-) one of the smallest divisions throughout the entire range.
- F. Thermometers shall be located so as to be easily read. In such cases where the thermometer cannot be easily located so as to be easily read, a remote reading type thermometer shall be installed.
- G. Thermometers used for liquid temperature shall be angle or straight way, with brass separable sockets.
- H. Where thermometers are installed in piping or tanks to be covered, they shall have an extension neck extending through the covering.
- I. Thermometers shall be so selected that normal operating temperature will be in the mid-range of the thermometer. Thermometers shall have a maximum of 2 degrees between graduations and shall have a maximum of 10 degrees between figures.
- J. Thermometers shall be:
  - 1. Weiss Type 9 VU

## 2.3 THERMOMETER WELLS:

- A. Thermometer wells shall be provided at all heat transfer devices at inlet and outlet conditions including but not limited to:
  - 1. Locations shown on plans and details.



- B. Thermometer wells shall be designed to hold an engraved stem thermometer. The wells shall be made of heavy brass and shall be approximately 6 inches long, shall project 2-1/2 inches into the pipe and shall have dust protecting caps and chains. Pipes smaller than 3 inches shall be enlarged at the points where the wells are installed. Wells shall be set vertical or at an angle so as to retain oil.
- C. Thermometer wells shall be:
  - 1. Terrice
  - 2. Marshalltown
  - 3. Ashcroft

#### 2.4 PRESSURE GAUGES:

- A. Pressure gauges shall be provided at all heat transfer devices at inlet and outlet conditions.
- B. Pressure gauges shall be single spring bourdon tube type with wear resisting moving parts and adjustable linkage. Gauge movement shall be suitably mounted in a cast aluminum case, baked black enamel finish, with glass front and plain removable ring. Gauges shall have 4 inch dials.
- C. Pressure gauges shall be accurate to within (+) or (-) 1.6% full scale.
- D. Range of gauge for each particular point of application shall be selected so that pointer is approximately in midpoint of scale under normal operating conditions.
- E. Pressure gauges shall be:
  - 1. Terrice
  - 2. Ashcroft
  - 3. Marshalltown

### PART 3 - EXECUTION

#### 3.1 CALIBRATION

- A. After installation, check and calibrate all devices where field calibration is practical.

3.2 THERMOMETERS:

- A. Thermometers shall be installed to be easily read from floor level, not over 8'-0" above floor. Where higher mounting heights are necessary remote reading type shall be substituted for model specified.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING – “LEAD FREE”

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. Bronze ball valve.
2. Ductile-iron, single-flange butterfly valve.
3. High Performance butterfly valve.
4. Check valves.
5. Iron, center-guided check valve.
6. Bronze gate valve.
7. Automatic Flow Control valves.
8. Balance valves (Calibrated).
9. Water Pressure Reducing valves.
10. Thermostatic Water Mixing valves.
11. Pressure Relief valves.
12. Temperature Relief valves.
13. Gas valves.
14. Gas Pressure Regulators.

B. Related Sections:

1. All sections of Division 22 Specifications apply to this section.

### 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. PTFE: Polytetrafluoroethylene plastic.
- H. SWP: Steam working pressure.

### 1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated.

### 1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.5 for flanges on steel valves.
  - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B16.18 for solder-joint connections.
  - 6. ASME B31.9 for building services piping valves.
  - 7. ASME B16.10 for ferrous valve dimensions.
  - 8. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF/ANSI 61-G and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3<sup>rd</sup> Party Certified.

D. Manufacturers:

1. The following ball valve manufacturers are acceptable:
  - a. Apollo
  - b. Nibco
  - c. Milwaukee
2. The following globe and check valve manufacturers are acceptable:
  - a. Apollo
  - b. Nibco
  - c. Milwaukee
3. The following balance valve (calibrated) manufacturers are acceptable.
  - a. Bell and Gossett
4. The following thermostatic mixing valves are acceptable:
  - a. Leonard
  - b. Symmons
  - c. Rada
  - d. Lawler
  - e. Apollo
5. The following temperature and pressure relief valve manufacturers are acceptable:
  - a. Watts Regulator Company
  - b. McDonnell and Miller, Inc.
  - c. Apollo
6. The following gas valve manufacturers are acceptable.
  - a. Apollo
  - b. Nibco
  - c. Milwaukee

7. The following gas pressure regulators are acceptable:
  - a. American Meter Co.
  - b. Maxitrol Co.
  - c. Pietro Fiorentini Gas Governors
  - d. Sensus

## 1.6 DELIVERY, STORAGE, AND HANDLING

### A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

### B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

### C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Products that come in contact with potable water shall be comply with NSF/ANSI 61-G and/or NSF/ANSI 372. Provide certification of product when requested by Architect/Engineer.
- B. All domestic water (i.e., cold water, hot water and hot water recirculating) shut off valves shall be lead free ball valves for piping 2-1/2" and smaller and lead free butterfly valves for piping 3" and larger unless noted otherwise.

- C. Where specifically noted on drawings or acceptable (in writing) to Engineer, gate and globe valves may be used in domestic water lines where throttling flow (i.e., globe valve) is required or water hammer (i.e., gate or globe valve) is a concern.
- D. Bronze valves shall be made with dezincification-resistant materials. Manufacturer shall provide third party certification. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Bronze Valves: NPS 2-1/2 and smaller with threaded or solder ends, unless otherwise indicated.
- F. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 6 and larger.
  - 2. Handwheel: For valves other than quarter-turn types.
  - 3. Hand lever: For quarter-turn valves less than NPS 6.
  - 4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
  - 5. Chainwheels: For valves NPS 6 and larger in equipment areas and located more than 7'-0" above finish floor or more than 3'-0" above ceiling shall be provided with operating chains, sprockets and guides. Bottom of chain loop shall be 5'-0" above finish floor or just above ceiling.
- I. Valves in Insulated Piping: With 2-1/4" inch (minimum) stem extensions and the following features:
  - 1. Ball Valves (2" and smaller): With extended operating handle of non-thermal-conductive material that meets UL 2043 approved for inside air plenum, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo "Therma-Seal" insulating tee-handle (-11 suffix in figure no.), NIBCO NIB-SEAL (-NS suffix in figure no.) handle extension; or equal.
  - 2. Ball Valves (2-1/2" and larger): Shall have minimum 2-1/4" (or 1/2" greater than insulation thickness) extended operating handle that allows operation of valve without disturbing insulation.

3. Butterfly Valves: Shall have minimum 2" (or ½" greater than insulation thickness) extended operating handle that allows operation of valve without disturbing insulation.

J. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES:

- A. Two piece, full port, Lead Free bronze ball valves with the capability of accepting extended operating handles.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 77CLF-A Series (-11 Therma-Seal for valves installed in insulated systems).
2. Description:
  - a. Standard: MSS SP-110
  - b. CWP Rating: 600 psig
  - c. Body Design: Two piece.
  - d. Body Material: Lead Free or Silicon bronze (ASTM Listed), corrosion resistant.
  - e. Ends: Threaded or soldered
  - f. Seats: Reinforced PTFE or TFE
  - g. Stem: Lead free brass
  - h. Ball: Lead free brass chrome plated
  - i. Port: Full

2.3 CHECK VALVES:

A. General:

1. Swing check valves shall be installed in horizontal lines or vertical lines where flow is upwards.



2. Lift check valves shall be installed in horizontal lines.

B. Bronze Swing Check Valves:

1. 200 CWP, Bronze Swing Check Valves with Bronze Disc:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 161S/T-LF.
- b. Description:
  - 1) Standard: MSS SP-139
  - 2) CWP Rating: 200 psig
  - 3) Body Design: Y pattern, horizontal flow
  - 4) Body Material: ASTM B584 bronze
  - 5) Ends: Threaded or Soldered
  - 6) Disc: Renewable Bronze

C. Bronze Lift Check Valves:

1. 250 CWP, Lift Check Valves with Nonmetallic TFE Disc:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-480-Y-LF.
- b. Description:
  - 1) Standard: MSS SP-139
  - 2) CWP Rating: 250 psig.
  - 3) Body Material: Silicon bronze (ASTM Listed), corrosion resistant.
  - 4) Ends: Threaded or Soldered.
  - 5) Disc: PTFE.

2.4 AUTOMATIC FLOW CONTROL VALVES – LEAD FREE (1/2" THRU 1-1/2"):

A. General:

1. The flow limiting control valve shall regulate flow with  $\pm 5\%$ .
2. The movable parts of the flow limiting valve shall be removable from the installed valve.

3. All valve assemblies shall include, as a minimum, 2 combination P/T ports and manual air vent with cap retainers, internal 20 mesh stainless steel strainer, and union.
  4. Provide manufacturer molded insulation cover and valve tag to indicate flow rate and model number.
- B. Threaded and Soldered Valves:
1. Threaded and soldered valves shall have all components manufactured from brass and 316 stainless steel. Valve shall be rated to 400 psig @ 275 deg. F.
  2. Soldered valves available only for ½" and ¾" valves.
- C. Valve Sizing:
1. Valves shall not exceed ASHRAE recommended GPM/pipe size.
  2. Valves shall have a 2-32 psi control range for all systems unless indicated otherwise.
- D. Valve shall be:
1. Griswold Controls "K Valve" Series.
- 2.5 BALANCE VALVES (Calibrated):
- A. General:
1. Valves shall have differential read-out ports with integral check valves.
  2. Valve shall have adjustment knob, memory stop indicator, insulated cover, calibrated nameplate, and positive shut-off.
  3. Provide manufacturer molded insulation cover.
  4. Valve shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
- B. Balance valves (calibrated) for domestic water service and hot water recirculating line:
1. Valves 3 inches and smaller shall be lead free brass body, stainless steel ball, TFE seat rings, threaded or solder end type rated for 400 psi at 250 degrees F (WOG of 200 psi, solder type).
    - a. B&G Circuit Setter Plus-LF Series
  2. Low flow applications (less than 2 GPM) shall be lead free brass body, stainless steel ball, TFE seat rings, solder end type for 200 psi at 300 degrees F.
    - a. B&G Circuit Setter Plus RF-LF Series

2.6 THERMOSTATIC WATER-MIXING VALVES:

A. General:

1. Provide a manually adjustable, thermostatic water-mixing valve with bronze body.
2. Mixing valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. The valve shall include checkstop and union on hot-water and cold-water supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated.
4. Bimetal thermostat shall be rated for 125 psig minimum.
5. Piping component finish shall be rough brass.

B. ASSE Requirements:

1. Mixing valves at point of source shall meet ASSE 1017.
2. Mixing valves at point of use shall meet ASSE 1070.
3. High/low type mixing valves shall meet ASSE 1017 and 1069.

C. Manifolderd, thermostatic water mixing valve assemblies:

1. Provide factory fabricated unit consisting of parallel arrangement of thermostatic water-mixing valves.
2. The valve shall include one large-flow thermostatic water mixing valve with flow control valve, pressure regulator, inlet and outlet pressure gauges, and one small-flow thermostatic water-mixing valve with flow control valve.
3. Assembly shall include outlet thermometer and factory or field installed inlet and outlet valves.

2.7 PRESSURE RELIEF VALVES:

A. General:

1. Pressure relief valves shall have a relieving capacity not less than the gross output of the equipment each one serves.
2. Valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. Valves shall be ASME coded and stamped.

B. Pressure relief valves for plumbing systems:

1. Pressure relief valves shall be for water systems, water heating equipment, and elsewhere as specified.

2.8 TEMPERATURE RELIEF VALVES:

A. General:

1. Temperature relief valves shall be sized according to AGA Listing.
2. Valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. Valves shall be ASME coded and stamped.

B. Temperature relief valves for plumbing systems:

1. Temperature relief valves shall be provided for water heating equipment and elsewhere as specified.

2.9 GAS VALVES:

A. General:

1. Gas valves with bronze trim are for non-corrosive gas only. Valves used with corrosive gas shall be suitable for application.

B. Bronze Ball valves (3 psig gas pressure and less, 3" and less, threaded):

1. Two piece, full port, brass ball valves with the capability of accepting standard and locking handles.
2. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 77F-100 Series.
3. Description:
  - a. Standard: MSS SP-110, CSA 9.1 (1/2 psi), CGA 3.16 (125 psi), CGA CR91-002 (5 psi)
  - b. CWP Rating: 600 psig.
  - c. Body Design: Two piece brass with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
  - d. Body Material: Brass.
  - e. Ends: Threaded.
  - f. Seats: Reinforced PTFE.

- g. Stem: Brass.
- h. Ball: Brass chrome plated.
- i. Port: Full.
- j. Handles: Standard. Provide locking type (up thru 2") at meter/regulator and where noted on drawings.

2.10 GAS PRESSURE REGULATORS:

A. General:

- 1. Gas regulators shall be provided at all locations where main and branch line gas pressures exceed the allowable unit or appliance inlet gas pressure.
- 2. All regulators shall be factory assembled.

B. 2 PSIG Inlet and Less:

- 1. Regulator shall include full capacity internal relief and vent.

C. Accessories:

- 1. Bug proof vent with stainless steel screen.

2.11 DRAINS AND VENTS:

A. A valve shall be provided at each equipment maintenance drain and where required for manual venting of air.

B. A stainless steel ball valve shall be provided.

2.12 COMPRESSED AIR VALVES:

A. General Duty Valves for Aluminum Piping Systems:

- 1. Ball and butterfly valves.
- 2. Valves may be made by piping system manufacturer that are compatible with piping or comparable valves specified in Section 22 0523 with applicable connections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem upright at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. When soldering use paste fluxes that are approved by the manufacture for use with Lead Free Alloys.

### 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 RELIEF VALVES:

- A. Combination temperature and pressure relief valves may be used where applicable.
- B. Pipe full size of connection to floor drain or as shown on plans.

### 3.5 ACCESSORIES:

- A. Provide one key for each ten key operated air cocks installed.
- B. Provide one wrench for each twenty balance valves installed. Minimum two per type.
- C. Provide one new flow balance meter with hoses, attachments, and carrying case. Should more than one meter be required to adjust flows, contractor shall provide one of each type.
- D. Provide a sufficient number of devices necessary to operate and maintain this system.

3.6 THERMOSTATIC WATER MIXING VALVE:

A. Start-Up and Testing:

1. The manufacturer's representative shall demonstrate to the Owner the proper operation of the valve.
2. The mixing valve, balance valve, and other devices in the system shall not be changed or adjusted in any way by the contractor without prior approval by the Owner.

3.7 AUTOMATIC FLOW VALVES:

- A. Valves shall be ordered only after equipment flows have been coordinated and submitted by Contractor and reviewed by the A/E. Automatic flow valve manufacturer shall verify equipment flows before ordering.

3.8 GAS PRESSURE REGULATORS:

A. Venting:

1. Vent routing, if not indicated on plans, shall terminate through the exterior wall a minimum of 25 feet from any building door or fresh air intake.
2. Terminate with bug proof vent.

END OF SECTION 220523

## SECTION 22 0529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of supports and anchors on all piping and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

- A. Products not otherwise specified in these documents shall be furnished by the listed manufacturers and installed in accordance with the manufacturers recommendation.
- B. Products used shall be consistent with industry practice for use in commercial or industrial installation.
- C. Codes and Standards:
  1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
    - a. ANSI B31.3 - Pressure Piping
    - b. National Fire Protection Association
    - c. Factory Mutual
    - d. International Building Codes
    - e. Manufacturer's Standardization Society Documents, MSS-SP-58, MSS-SP-69
    - f. Pipe Fabrication Institute, Standard ES-26



- g. AISC Specification for the Design, Fabrication, and Erection of Structural Steel Buildings

D. Manufacturers:

- 1. The following pipe hanger and support manufacturers are acceptable:
  - a. Cooper B-Line
  - b. Pipe Hangers and Devices Mfg. Inc.
  - c. Anvil International
  - d. Elite Components

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. It shall be the Contractor's responsibility to provide an adequate pipe support system in accordance with recognized engineering practices using, where possible, standard, commercially available hangers, support, guides, anchors and accessories.
- B. Model numbers are indicated for products not exposed to ambient conditions. The products exposed to ambient conditions shall be a similar product but with the material or finish specified for products exposed to ambient conditions.
- C. Materials shall be selected to prevent electrolysis and minimize corrosion for the environment in which the product is to be installed.
- D. Hanger shall be sized for insulation to run through hanger except small size domestic hot water piping as indicated.

### 2.2 SAFETY FACTOR:

- A. All attachments, rods, and accessories selected based on weight load shall be selected for a two times safety factor minimum.

### 2.3 SEISMIC RESTRAINTS:

- A. Where seismic restraints of components is required, attachments shall be per the requirements of the Vibration and Seismic Control for plumbing specifications.

2.4 PRODUCTS EXPOSED TO AMBIENT CONDITIONS:

A. Materials:

1. The material for all accessories including, but not limited to, rods, bolts, fasteners, inserts, saddles, supports, anchors, clamps, auxiliary steel, and accessories shall be stainless steel or hot dipped galvanized unless specifically noted otherwise.

B. Hangers:

1. Clevis hanger shall be stainless steel or hot dipped galvanized finish.
2. Swivel loop hangers shall be zinc electroplate finish.
3. Roller hangers shall be zinc electroplate finish.

C. Supports:

1. Roller supports shall be zinc electroplate finish.

D. Shields:

1. Shields shall be stainless steel.

2.5 PIPE HANGERS, SUPPORTS, AND ACCESSORIES - GENERAL (INDOOR):

A. General:

1. Other finishes may be specified for specific applications.
2. All threaded rods shall be hot dipped galvanized or stainless steel.

B. Hangers:

1. Swivel loop hangers for insulated pipe shall be carbon steel with zinc electroplate finish.
2. Clevis hangers for insulated pipe shall be carbon steel or carbon steel with zinc electroplate finish.
3. Roller hangers shall be carbon steel with cast iron roller.

C. Supports:

1. Roller supports shall be carbon steel with cast iron roller.

D. Shields and saddles:

1. Shields shall be carbon steel with zinc electroplate finish.

2. Saddles shall be carbon steel.

E. Insulation at shield:

1. Insulation shall be full pipe coverage (360 degrees).
2. Insulation shall be calcium silicate with FRK jacket and self-sealing flaps.
3. Insulation shall be suitable for 20 degrees F to 1200 degrees F temperature and 100 psi compressive strength (minimum).
4. Insulation shall overhang shield by 1" (minimum) each side. Insulation shall be equal to thickness of adjacent pipe insulation.

2.6 PIPE HANGERS - INSULATED COLD PIPING:

- A. All domestic cold water piping only - Swivel loop hanger with shield:
1. B-Line Fig. 200 with B3151 shield
  2. At contractor's option, clevis hanger may be used.

2.7 PIPE HANGERS - INSULATED HOT PIPING:

- A. All domestic hot water piping only - swivel loop hanger with shield, clevis hanger with shield, or long leg clevis hanger:
1. B-Line Fig. 200 with B3151 shield

2.8 PIPE HANGERS - NON INSULATED PIPE (STEEL AND CAST IRON):

- A. All pipe sizes (cast iron pipe) - clevis hanger:
1. B-Line B3102
- B. All pipe sizes (steel pipe) - clevis hanger:
1. B-Line B3100
- C. All pipe sizes (galvanized pipe) - clevis hanger:
1. B-Line B3100 (with hot dipped galvanized finish)
  2. B-Line B3100 (with electro galvanized finish)

2.9 PIPE HANGERS - NON INSULATED PIPE (COPPER or Aluminum):

- A. All pipe sizes - Swivel loop hanger:
  - 1. B-Line B3170 CTC (with PVC coating)

2.10 PIPE HANGERS - NON INSULATED PIPE (PVC, CPVC):

- A. Pipe 2" and smaller - swivel loop hanger:
  - 1. B-Line Fig. 200C (with PVC coating)

2.11 SPECIAL HANGERS:

- A. General:
  - 1. Finishes shall be provided equal to that specified elsewhere in these specifications for the specified piping system.
- B. Limited headroom - clevis hangers:
  - 1. B-Line B3109

2.12 PIPE SUPPORTS - GENERAL:

- A. General:
  - 1. Finishes, shields, saddles, and shield insulation shall be provided as specified for pipe hangers for each system requiring pipe supports.
- B. Roll pipe support without vertical adjustment:
  - 1. B-Line B3117SL
- C. Roll pipe support with vertical adjustment:
  - 1. B-Line B31185L
  - 2. B-Line B3122

2.13 PIPE HANGER SPACING:

- A. General:
  - 1. The maximum spacing for pipe hangers and supports shall not exceed those stated in these specifications or the hanger manufacturer's recommendations, which is less.

2. Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components.
3. Hangers shall be provided within 12" of each change of direction, at each valve, and at equipment connections.
4. Pipe not listed shall meet the spacing requirements of the manufacturer.

B. Cast Iron Pipe (no hub sanitary):

1. Pipe shall be supported at each horizontal joint, at each horizontal branch connection and each terminal end. Hanger shall be within twelve inches of the coupling.

C. Non-metallic Pipe (PVC):

1. Provide spacing as recommended by the manufacturer but no greater than 4 feet.

D. Copper Pipe and Tubing:

<u>Size</u>	<u>Max. Span Ft.</u>
Smaller than 1-1/2"	5
1 1/2" and larger	8

E. Steel (Std. Weight):

<u>Size</u>	<u>Max. Span Ft.</u>
1 1/2" and smaller	7
2" and larger	10

2.14 HANGER RODS:

- A. Threaded rods, if not indicated otherwise, shall be carbon steel with zinc electroplate finish.
- B. Where seismic restraints of components are required, rod sizes shall be per the requirements of the Mechanical Sound, Vibration, and Controls specifications.
- C. Rod capacity based upon ASTM A107 at 650 degrees F is as follows:

<u>Rod Dia.</u>	<u>Max. Load</u>	<u>Max. Load (@ 2 x SF)</u>
3/8	610	305
1/2	1130	565
5/8	1810	905
3/4	2710	1355
7/8	3770	1885
1	4960	2480

2.15 MISCELLANEOUS STRUCTURES:

A. Metal Roofing Systems:

1. Provide steel angle stiffeners and supplemental steel as required by the metal roofing system manufacturer to attach hangers and supports to purlins.
2. Provide steel angles or channels to support hangers located between purlins.

2.16 AUXILIARY SUPPORTS, FASTENERS, AND ACCESSORIES:

- A. Provide all auxiliary supports, anchors, and fasteners necessary for the installation of piping, equipment, and accessories.
- B. Supports shall include angles, channels, flat steel, rods, bolts and appurtenances.
- C. Special supports shall be provided where standard hanger, supports, or attachments cannot be used. This includes, but is not limited to, use of trapeze supports, suspending supports from other supports (where acceptable to manufacturers, etc.).

2.17 SWAY BRACING:

- A. Sway bracing shall be located and constructed for pipe subject to horizontal movement unless movement is specifically designed to meet seismic requirements.
- B. On no hub cast iron sanitary systems where top of pipe is more than 18 inches from hanger attachment point, sway bracing shall be provided on every other hanger

2.18 CHANNEL SUPPORTS:

A. General:

1. Channel supports shall be utilized wherever practical and whenever a channel support provides a cleaner installation than individual attachments to the structure.

B. Construction:

1. Channel supports shall be 12 gauge and dimensions as necessary to meet project conditions.
2. Channels in conditioned spaces or in plenums above conditioned spaces shall be pregalvanized or powder coated carbon steel.
3. Channels exposed to ambient conditions shall be stainless steel or PVC coated
4. Channels shall have holes, slots, knockouts, etc. as required by the Contractor.

- C. Clamps and Accessories:
  - 1. Clamps, accessories, fasteners, etc. shall generally be the same materials as the channel supports unless indicated otherwise.
  - 2. Pipe clamps for indoor pipe shall be:
    - a. All piping - pipe cushion clamp
- D. Manufacturers shall be:
  - 1. Cooper B-Line
  - 2. Unistrut
  - 3. Pipe Hangers and Devices Mfg., Inc.
  - 4. Anvil International

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. Provide all steel and concrete required for support and anchoring of pipes other than shown on structural or architectural drawings.
- B. Contractor shall bear all responsibility for materials and workmanship as described in this section, and shall make sure that all hangers and supports are properly and permanently connected to building structure.
- C. All pipe supports shall be designed to avoid interferences with other piping, hangers, electrical conduits and supports, building structures and equipment.
- D. Guide points for expansion joints shall be located and constructed wherever required or shown on drawings and at each side of an expansion joint or loop, to permit only free axial movement in piping systems. Guides shall be securely anchored to structure.
- E. Provide hanger rod nuts on both sides of clevis and trapeze hangers.

#### 3.2 SUBMITTAL:

- A. Manufacturer shall be responsible for reviewing all plans, specifications, and existing conditions to determine the types, quantities, and accessories required to provide a complete system of pipe support.
- B. Submit shop drawings for each product to be used and indicate where the product is to be installed (i.e., steam piping in tunnel, chilled water pipe in crawl space, etc.).

3.3 APPROVALS REQUIRED:

- A. The Contractor shall request and receive written approval as follows before ordering support and attachment equipment and materials:
  - 1. Letter from lightweight metal truss manufacturer.
  - 2. Letter from metal roofing system manufacturer.
- B. The letters shall indicate methods of attachment to all structural components and the locations of these attachments.

3.4 AUXILIARY SUPPORTS, ANCHORS, AND FASTENERS:

- A. Supports attaching to steel structure shall be by bolting or clamping without penetrating structural member. Welding is not permitted without written permission.
- B. All fasteners shall be provided which resist loosening from vibration.

END OF SECTION 22 0529



## SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical identification on all plumbing equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work furnished and installed shall comply with all local codes and ordinances and shall meet or exceed the standards and procedures (latest editions) of the following:
  - a. ANSI A13.1 for the identification of piping systems.
  - b. ANSI/NEMA Standard Z535.1.

##### B. Manufacturer:

1. The following mechanical tag, band, nameplate, and identification marker manufacturers are acceptable:
  - a. Seton Name Plate Corporation
  - b. T&B/Westline Products
  - c. Brady
  - d. MSI

## PART 2 - PRODUCTS

### 2.1 VALVES:

- A. All valves shall be tagged except for the following:
  - 1. Exposed shutoff valves at plumbing fixtures.
- B. Attach to each valve a 1-1/2" round brass tag stamped with designating number and system type (CW, HW, CHW, etc.) 1" high filled in with black enamel. Connect with braided cable and metal clamp.
- C. Coordinate valve numbering to avoid duplication.
- D. Provide valve tagging in accordance with the Owner's standard practice for labeling.

### 2.2 NAMEPLATES:

- A. Nameplates shall be fabricated on black lamacoid with beveled edges. Markings shall be cut through to white background.
- B. Markings or lettering shall be minimum:
  - 1. 1/2" high on access doors
  - 2. 1/4" high on motor control centers
  - 3. 3/16" high on switches and other similar devices
- C. All information shall be scribed on a single nameplate per device.

### 2.3 SWITCHES AND OTHER SIMILAR DEVICES:

- A. Devices to be identified include:
  - 1. Control panels.
  - 2. Similar equipment.
- B. Nameplate shall include:
  - 1. Equipment description: HV #1, etc.
  - 2. Switch position as required: Summer/Winter, On/Off, etc.

### 2.4 PIPING PAINTING:

- A. The following exposed piping systems, bare and insulated, in Lab area and all other spaces where visible without removing ceiling, shall be given two coats of finish paint over the prime coat:

Cold Water – Color selected by Architect  
 Hot Water – Color selected by Architect  
 Hot Water Return – Color selected by Architect  
 Natural Gas Piping – Yellow

2.5 PIPE CODING (STICK ON):

A. Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow on all piping systems.

B. Pipe identification sizing shall be:

OUTSIDE DIAMETER OF PIPE OR COVERING	LENGTH OF COLOR FIELD INCHES	SIZE OF LETTERS INCHES
3/4 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

C. Flow direction arrows shall be black on color background. Show flow direction arrows immediately adjacent to all pipe identification markers.

D. Markers shall be self-sticking type.

2.6 PIPE CODING (WRAP AROUND):

A. Apply color coded coiled plastic pipe bands identifying service and direction of flow on all piping systems.

B. Pipe identification shall meet ANSI A13.1 for color, letter height, and band size.

C. Bands shall have flow direction arrows.

D. Larger sizes shall have stainless steel springs.

E. Manufacturer shall be:

1. MSI MS-970

2.7 LOCATION MARKERS:

A. Provide approved ceiling tile markers near removable ceiling panels to indicate the location of valves or other devices. Markers shall be adhesive type of various colors.

### PART 3 - EXECUTION:

#### 3.1 PIPE CODING:

- A. On exposed piping apply bands at 20 foot centers on straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor or ceiling.
- B. On concealed piping installed above removable ceiling construction, apply bands in the manner for exposed piping.
- C. On concealed piping installed above nonremovable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
- D. Apply bands at exit and entrance points to each vessel, tank or piece of equipment.
- E. For insulated pipes apply bands after insulation and painting work has been completed.
- F. Follow manufacturer's instructions for application procedures using noncombustible materials and contact adhesives.

#### 3.2 PIPE CODING SUBMITTAL:

- A. Submit a chart indicating each system and colors available for background and lettering. (The Contractor shall also include listing of existing identification colors used in this facility.)

#### 3.3 VALVES:

- A. Furnish to Owner's Representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and room number, valve size and service controlled.

#### 3.4 CEILING MARKERS:

- A. Ceiling markers shall be attached to the ceiling grid as close to indicated equipment as possible.
- B. A schedule of colors shall be submitted to the engineers for approval.

#### 3.5 NAMEPLATES:

- A. Submit listing of all nameplates with associated information to A/E for approval before fabrication.
- B. Mount limacoid nameplates with chromium plated acorn head screws.
- C. Coordinate method of attachment and location of nameplate with contractor who is responsible for the installation of the device.

END OF SECTION 220553

## SECTION 220592 - SYSTEM START-UP

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the start-up of all building mechanical systems where shown on the drawings and specified hereinafter.

##### B. Description:

1. These systems shall include:
  - a. Domestic water systems
  - b. Sanitary drain, waste and vent systems

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and standards:

1. All work shall meet or exceed the standards and procedures of the following (latest edition):
  - a. AWWA Standards
  - b. NFPA 99

##### B. Start-up of equipment shall be by manufacturer's representative unless noted otherwise.

##### C. Tests, in addition to those specified herein, required to prove code compliance, to meet insurance requirements, and to verify proper installation by the A/E, owner, or authorities having jurisdiction shall be provided by the Contractor.

##### D. All tests, instruments, and procedures shall be in accordance with the AABC National Standards and system test and balance specifications.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. All concealed work must remain uncovered until required tests have been completed. Sections of the system may be tested prior to concealing as outlined hereinafter.
- B. The Owner and the A/E shall be notified in writing a minimum of three working days prior to any tests being performed.
- C. Local, state and federal authorities having jurisdiction shall be notified in writing with sufficient time to schedule inspection as required by the authority.
- D. In no case shall a system be started or operated in such a manner that the system or component pressure or temperature ratings, or the pressure or temperature to which a system or component has been tested, be exceeded.

### 2.2 START-UP:

- A. Systems shall be started up by the Contractor except as required in specific portions of the mechanical specifications and as follows:
  - 1. Pumps - factory trained manufacturer's representative
  - 2. Thermostatic Mixing Valves – manufacturer's technician

### 2.3 STARTING THE PIPING SYSTEMS:

- A. Prior to putting any piping system in service, it shall be tested and thoroughly cleaned according to the procedures as specified below. The Contractors are responsible to take all precautions necessary to prevent contamination of existing domestic water and also to prevent unauthorized use, when connecting new systems to existing water lines.

### 2.4 STERILIZATION OF POTABLE WATER SYSTEMS:

- A. All pipe lines and all appurtenances, both existing and new, which have been exposed to contamination by reason of this construction shall be sterilized before being placed into service.
- B. Prior to chlorination, all systems shall be flushed with water at a system velocity of not less than 2.5 feet per second.
- C. Sterilization shall be performed after all hydrostatic tests have been performed and before system is placed in service.
- D. All potable water systems shall be chlorinated in accordance with procedures described in AWWA Standards for disinfecting water mains, AWWA C601. The entire line shall be chlorinated with a gas-water mixture, or calcium hypochlorite (70% available chlorine) and water. The chlorinating agent shall be applied at the beginning of the section

adjacent to the feeder connection and shall be injected through a corporation stop, hydrant or other connection insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in such amounts as to produce a dosage of 50 parts per million. Lines previously filled shall be treated to a concentrated dosage at intervals along the line.

- E. A 24-hour residual of 10 parts per million shall be produced in all parts of the line. During the chlorination process all valves, hydrants and accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal bacteriologically, to those of the permanent source of supply and shall conform otherwise in all respects to the requirements of the South Carolina Department of Health and Environmental Control. Two acceptable bacteriological tests shall be obtained 24 hours apart and reported by an independent laboratory. Test results must be on file with the Architect/Engineer prior to State Inspection.
- F. Furnish all HTH or liquid or gas chlorine required for sterilization and shall furnish all equipment and labor required for the work.

## 2.5 PIPING SYSTEM TESTS:

- A. General:
  - 1. Upon completion of each system of work under this Division and at a designated time, all piping shall be pressure tested for leaks.
  - 2. All piping located underground shall be tested before backfilling.
  - 3. Sections of the system shall be tested prior to concealing the piping in walls, chases, false ceilings, etc.
  - 4. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to Owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted.
  - 5. All equipment not capable of withstanding the test pressure shall be valved off during test.
  - 6. Provide all gauges, valves, caps and accessories to properly test system.
  - 7. At no time shall a system be tested at a pressure greater than the piping system or component is rated.
- B. Drain, Waste, Storm and Vent Pipe:
  - 1. All drain, waste, storm drainage and vent piping including branch bends and joints shall be tested before fixtures are set by closing all openings and filling entire system with water to a height of not less than ten feet above highest floor, or a pump may be used to maintain an equivalent pressure.



2. Test pressure shall be maintained for thirty minutes when using pump method. When using water column method, test period shall also be thirty minutes and water level shall not drop more than four inches.

3. No tests shall be made during freezing weather.

C. Domestic Water Pipe:

1. Where a portion of water system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.

2. Water used for testing shall be from a potable source of supply.

3. Upon completion of rough-in and before setting fixtures, hydrostatically test water piping downstream of pressure reducing valves to 1-1/2 times the operating pressure, but not greater than 80 psig.

4. Hydrostatically test water piping upstream of pressure reducing valves to 1-1/2 times the operating pressure or 100 PSIG, whichever is greater.

5. The test shall be a minimum of two (2) hours without pressure drop.

D. Plumbing Fixtures:

1. Water shall be turned onto all supply lines, all fixtures shall be demonstrated to operate properly, valves and stops adjusted, packed and repacked as may be required to eliminate leaks and produce proper flow, piping shall be adjusted to provide proper circulation and to prevent hammer and thumping.

E. Water Closets:

1. Water closets shall be tested and adjusted to flush efficiently without undue noise.

F. Gas Piping:

1. Gas piping shall be tested in accordance with these specification, the current edition of the International Fuel Gas Code (IFGC), or the local authority have jurisdiction, whichever is greater. If the contractor does not have a copy of the section of the International Fuel Gas Code, Buford Goff & Associates will provide a copy upon request.

2. Piping shall be tested to 1 ½ times working pressure but not less than 5 PSIG.

3. Testing shall be performed before painting. If the piping is painted before testing, test pressure shall be 1 ½ times working pressure but not less than 90 PSIG.

4. Tests shall run for ½ hour for each 500 cu ft of pipe volume.

5. Pressure shall be measured with a manometer.

6. The test gas shall be air, nitrogen, carbon dioxide or an inert gas.
7. Connection between new and existing pipe shall be tested by an approved leak detection method.
8. Isolate appliances or plug lines as required by the IFGC.

## 2.6 SYSTEM START-UP:

### A. General:

1. System shall be started and checked to ensure safe and proper operation.
2. Minimum requirements are listed for each system and are in addition to manufacturer start-up requirements and the requirements stated in the specific sections of the specifications.

## PART 3 - EXECUTION

### 3.1 SUBMITTALS:

#### A. Submit to the A/E all test results including a minimum of the following information:

1. System tested.
2. Location of test.
3. Date, time, and ambient temperature at test startup and completion.
4. Persons present for test.
5. Duration of test.
6. Test equipment.
7. Test results.

#### B. Partial system may be done at the Contractor's option except tests shall be completed:

1. For each phase designated by contract documents;
2. And, in accordance with building contracts schedule for completion;
3. And, as required to turn over portions of the system for the Owner's use.

#### C. Reports shall include but not be restricted to:

1. Tests during construction.
2. Manufacturer's start-up of equipment.

3. Manufacturer's representative start-up of equipment.
  4. Contractor start-up of system.
- D. Reports shall be submitted within ten days of test completion.

3.2 ENGINEER REVIEW:

- A. The A/E shall, at his discretion, recheck any or all of the test work. Provide ample number of technicians and test equipment to perform the tests required.
- B. All systems not accepted shall be retested.
- C. Systems shall be retested and rechecked until accepted by all parties.

END OF SECTION 220592

## SECTION 220601 - HYDRONIC SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of hydronic specialties where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures (latest editions) of the following:
  - a. USA Standard Face to Face Dimensions of Ferrous Flanged Valves ANSI B16.10.
  - b. USA Standard for Cast Iron Pipe Flanges and Flanged Fittings. ANSI B16.1.
  - c. SHEMA.

- B. All pressure vessels including expansion tanks, air separators and similar equipment shall be constructed, tested and stamped in accordance with ASME standards.

- C. Equipment shall be stamped for (125) (250) psig working pressure.

##### D. Manufacturers:

1. The following strainer manufacturers are acceptable:
  - a. Sarco
  - b. Mueller
  - c. Armstrong

2. The following expansion tank (domestic) manufacturer's are acceptable:
  - a. Amtrol
  - b. Therm – X-Trol
  - c. Wessels
3. The following dielectric fitting manufacturers are acceptable:
  - a. Perfection Corporation
  - b. Victaulic

## PART 2 - PRODUCTS

### 2.1 STRAINERS:

- A. All strainers shall have cast iron, forged steel, or bronze bodies of ample strength for the pressure to which they shall be subjected, removable cylindrical or conical screens of Monel or stainless steel and suitable flanges or tappings to connect with the piping they serve. They shall be of such a design as to allow discharge of accumulated dirt, and to facilitate removal and replacement of a strainer screen, without disconnection from the main piping.
- B. Strainer screen perforations shall be:
  1. Water - 1/16"
- C. All strainers shall be provided with flanged covers for screen removal in lieu of screwed covers wherever obtainable.
- D. All strainer screens 8" and larger shall be reinforced.
- E. All strainers in piping, (including all pump inlets), shall be Y-pattern, set in a horizontal (or vertical downward) run of the pipe. Where this is not feasible, strainers may be of enlarged cross-section type.
- F. Provide a valve dirt blowoff with each strainer 2-1/2" and larger.
- G. Provide a 6" capped nipple for strainers 2" and smaller.

### 2.2 UNIONS AND FLANGES:

- A. Steel pipe:
  1. Unions shall be malleable iron, zinc coated, ground joint type for steel pipe.

B. Copper tubing and pipe:

1. Unions shall be brass.

C. Flanges or unions shall be installed in the following locations:

1. At locations indicated on plans.
2. At equipment to permit mechanical removal of equipment.
3. At equipment to permit servicing.
4. At pressure reducing valves to permit mechanical removal of the valve.

2.3 DRAINS:

A. Drains are to be provided as follows:

1. Provide hose and drain valves near the heel of all main water risers in an accessible location. Drain shall be 3/4" or size indicated, whichever is larger.
2. Provide drain valves for complete drainage of piping, including the system side of all pumps. Drain shall be 3/4" or size indicated, whichever is larger.

B. Provide deep seal P-traps from all condensate drain pans.

2.4 EXPANSION TANK (DOMESTIC):

A. Tanks shall be constructed of steel in accordance with ASME standards.

B. Tank shall be painted on the exterior with a rust inhibiting paint.

C. Tank shall have a precharged air chamber, heavy duty butyl diaphragm and rigid polypropylene liner.

D. Tank shall be equipped with:

1. Stainless steel connections

2.5 DIELECTRIC FITTINGS:

A. Dielectric nipples shall have a high temperature, inert, thermoplastic copolymer liner. The nipple shall be electro-zinc plated steel. Current flow across a 3/4" nipple shall not exceed .010 ma.

B. Provide dielectric fittings:

1. To isolate dissimilar metals in piping systems
2. At connections to all water heaters

3. At water lines at building entrance points
  4. To isolate dissimilar metals in piping systems and equipment
- C. Dielectric fitting shall be:
1. Hydronic systems 4" and smaller - dielectric nipple

### PART 3 - EXECUTION

#### 3.1 STRAINERS:

- A. There shall be approved strainers in the inlet connections to each pump, each automatic valve, each pressure reducing valve, and as shown on drawings.
- B. Strainers shall be so arranged as not to "trap" lines and to facilitate disconnection and opening-up for cleaning. Unless otherwise indicated, strainers shall be line size.
- C. Dirt blowoff valves shall be 6" to 1'-0" below strainer or as directed. Nipples and valves to be full size of strainer blowoff tapping. For all strainers, the blowout connection is to terminate in an approved manner, at a point where there will be no risk of flooding or damage.
- D. All strainers installed in horizontal piping shall be installed flat (on side) except strainers at pumps shall be installed in a vertical position.

#### 3.2 EXPANSION TANK (GENERAL):

- A. Provide threaded rod supports mounted to building structure to support tank.

END OF SECTION 220601

## SECTION 220700 - PLUMBING INSULATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all Mechanical Equipment, Piping, Ductwork and appurtenances where shown on the drawings and specified hereinafter under applicable sections of this specification.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 220716 – Plumbing Equipment Insulation
  2. Section 220719 – Plumbing Piping Insulation

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All insulation materials must have a maximum 25/50 flame/smoke rating as tested by ASTM E-84, NFPA 255 and UL 723 except where specifically noted otherwise.
2. OSHA.
3. Flame/smoke rating shall be minimum 25/250 in equipment rooms where the room is not used as a plenum.

B. Insulation thickness shall equal those recommended by ASHRAE 90.1 or as scheduled, whichever is greater. Surface temperatures shall be below 140 degrees F.

C. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above.

D. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facing to impart flame and smoke safety shall be permanent. The use of water soluble treatments is prohibited.



- E. Installation and materials shall meet the requirements of the International Building Codes.
- F. All insulation work shall be applied by mechanics normally employed in the trade. All insulation shall be installed in accordance with the manufacturer's recommendations.
- G. All insulation furnished under this Division of the specifications shall be the product of one manufacturer except for special applications.
- H. Manufacturers:
  - 1. The following manufacturers of sealants, adhesives, and mastics shall be:
    - a. Foster

## PART 2 – PRODUCTS

### 2.1 MASTICS, SEALANTS, AND ADHESIVES:

- A. General:
  - 1. Materials shall be as recommended by the insulation manufacturer.
  - 2. Products shall be applied as recommended by the manufacturer for that specific application.
  - 3. The number of coats and thicknesses shall meet or exceed the manufacturer's recommendation or as indicated in these specifications or on the plans, whichever is greatest (coats and thickness).
  - 4. Materials shall meet LEED requirements for low emitting products.
- B. Finish:
  - 1. When material is applied where it is to be painted, the material shall be coated, if necessary, to allow the material to be properly painted with use of special paints or primers.

## PART 3 - EXECUTION

### 3.1 GENERAL:

- A. All insulation materials shall be delivered and stored in manufacturer's container and kept free from dirt, water, chemical and mechanical damage.
- B. Insulation shall be applied by experienced workmen in a workmanlike manner.
- C. Insulation shall not be applied until all pressure testing has been completed, inspected and released for insulation application.

- D. Surfaces to be insulated shall be clean and dry.
- E. All insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.
- F. Insulation shall be run continuously through walls, ceiling openings, and sleeves.
- G. Items that are factory insulated shall not receive additional insulation where not otherwise specified.

3.2 INSTALLATION:

- A. General:
  - 1. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal.
  - 2. Insulation on equipment that must be opened periodically for inspection, cleaning, and repair must be constructed so insulation can be removed and replaced without damage.

END OF SECTION 220700

## SECTION 220719 - PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including valves, mechanical couplings, fittings, flanges, strainers, expansion joints, and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 22 0700 – Plumbing Insulation

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturers:

1. The following fiberglass piping insulation manufacturers are acceptable:
  - a. Owens/Corning
  - b. Knauf
  - c. Johns Manville
2. The following elastomeric pipe insulation manufacturers are acceptable:
  - a. Armacell
  - b. K-Flex
  - c. Nomaco Insulation

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.

### 2.2 TYPES OF INSULATION:

#### A. Fiberglass Insulation:

##### 1. Physical properties:

- a. Thermal conductivity (k) is 0.25 at 100 degrees F.

##### 2. Jacket:

- a. ASJ jacket with or without self-sealing adhesive system.

##### 3. Insulation shall be:

- a. Owens/Corning Heavy Density Fiberglass Insulation ASJ/SSL or ASJ

#### B. Elastomeric Insulation:

##### 1. General:

- a. The insulation shall have a factory applied adhesive closure system.

##### 2. Physical properties:

- a. Thermal conductivity (k) is 0.27 at 75 degrees F.

- b. Water transmission is 0.08 perms - inch.

- c. Will not significantly contribute to fire.

##### 3. Insulation shall be:

- a. Armacell type AP Armaflex SS

- b. K-Flex USA type LS Seam-Seal or Insul-Lock

- c. Nomaco Insulation FlexTherm

### 2.3 PIPE INSULATION APPLICATION:

#### A. General:

- 1. All fittings, valves, and accessories in the piping system shall be insulated similar to the piping system.

2. Insulation in return air plenums shall have a flame/smoke rating not to exceed 25/50.

B. Fiberglass Pipe Insulation:

1. Fiberglass pipe insulation is required for the following piping systems:
  - a. Indoor piping up to 850 degrees F except for those where other types of pipe insulation is specified.

C. Elastomeric Insulation:

1. Elastomeric and polyolefin pipe insulation is only permitted on the following:
  - a. Piping concealed in walls, partitions and chases.
  - b. Where details or notes specifically allow the use of elastomeric or polyolefin insulation.

2.4 FITTINGS:

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Fiberglass Pipe Insulation:

1. Piping (up to 1-1/4"):
  - a. Fittings may be mitered at contractor's option.
2. Piping (1-1/2" and larger):
  - a. Fittings shall be insulated with 3/4 PCF density, all service faced FSK duct wrap, 2" thick.

C. Elastomeric Insulation:

1. Piping (up to 3/4"):
  - a. Fittings may be mitered at contractor's option.

D. All Other Insulation:

1. Piping (all sizes):
  - a. Per manufacturer's recommendations.

2.5 GLASS FABRIC:

A. General:

1. Fabric shall be 100% fiberglass scrim with non-combustible finish.
2. Fabric shall be 1.9 oz. + .3 oz. per square yard.
3. Thread count shall be 20 x 10 (yarns per inch).

2.6 ADDITIONAL INSULATION REQUIREMENTS:

A. Accessories subject to condensation:

1. This shall include but not be limited to:
  - a. Piping to gauge
  - b. Valve stems
2. Wrap component subject to condensation with self-stick neoprene insulating tape.

- B. Where insulation is specified for piping, insulate similarly all connections, vents, drains, fitting, valves, mechanical couplings, expansion bellows and any appurtenances and piping connected to system subject to heat loss or gain. Unions, couplings, or flanges provided at equipment for removal of heat exchanger, condenser, or evaporator heads shall be insulated with removable molded blocks.

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL:

- A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.
- B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 FIBERGLASS INSULATION SCHEDULE:

A. Domestic Cold Water Piping:

1. Up to 1-1/4" pipe - 1/2" thk.
2. 1 1/2" pipe and larger - 1" thk.

B. Domestic Hot Water Piping:

1. Up to 1-1/4" pipe - 1" thk.

2. 1½" pipe and larger – 1-1/2" thk.

### 3.3 ELASTOMERIC AND POLYOLEFIN INSULATION SCHEDULE:

- A. Domestic Cold Water Piping:
  1. All pipe - ½" thk.
- B. Domestic Hot Water Piping (without heat tracing):
  1. All pipe - 1" thk.
- C. Horizontal Drinking Fountain Waste Tubing:
  1. All pipe - 3/4" thk.

## PART 4 - EXECUTION

### 4.1 INSTALLATION:

- A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.
- B. Outward clinching staples shall be used on ASJ jacketing and be sealed with vapor barrier sealer on cold pipe. Piping not easily accessible for repair or maintenance shall be banded with three aluminum bands per section.
- C. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.
- D. Butt joints and seams of elastomeric and polyolefin insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.
- E. Insulation for heat traced pipe shall be sealed with tape or adhesive. Staples shall not be used.

### 4.2 ANCHORS AND SUPPORTS:

- A. Anchors and supports that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.
- B. Jacketing shall be carried through hanger on inside of 16 gauge sheet metal shields and sealed to maintain continuous vapor barrier except domestic hot water may be insulated around the hanger.
- C. Where inserts occur at pipe supports and guides, provide the following:
  1. On hot pipes apply 3" wide vapor barrier tape or band over the butt joints.

2. On cold pipes apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with 3" wide vapor barrier tape or band.

4.3 FITTINGS:

A. General:

1. Apply vapor barrier to insulation and all seams.

B. FSK Ductwrap:

1. Apply pressure sensitive vapor barrier tape.

4.4 METALLIC JACKETING:

A. Jacketing shall be held in place with a friction type, Z lock, or 2" overlap joint. Joints shall be completely sealed along the longitudinal seam and shall be installed to shed water. Circumferential joints shall be sealed by use of 2" wide butt strips. ½" bands shall secure jacketing. Space as recommended by the manufacturer.

B. Straps shall secure jacket. Straps shall be the same material as jacket. Provide 1/2" straps for jackets up to 12" in diameter. Provide 3/4" straps for 14" and larger diameter jackets.

4.5 MULTI-LAYER INSTALLATION:

A. Joints shall be staggered.

END OF SECTION 220719



## SECTION 221100 - PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pipe, pipe fittings, accessories and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All pipe and pipe fittings shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:
  - a. Ferrous Pipe and Fittings:
    - 1) Cast Iron Soil Pipe and Fittings, Hub And Spigot. ASTM A74
    - 2) Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary System. CISPIS 301 and ASTM 888
    - 3) Malleable Iron Screwed Fittings. ANSI B16.3
    - 4) Steel Flanges. ANSI B16.5
    - 5) Steel Fittings. ANSI B16.9
    - 6) Steel Pipe, Welded or Seamless, Black or Galvanized. ASTM A53, A106, and A120.
    - 7) Steel Pipe, Welded or Seamless (for coiling) Black or Galvanized. ASTM A53
    - 8) Wrought Iron Pipe. ASTM A72

- b. Non-Ferrous Metallic Pipe and Fittings:
    - 1) Pipe Fittings, Brass or Bronze, 125 and 250 lbs., Cast or Wrought. ANSI B16.15
    - 2) Solder Joint Fittings, Pressure, Copper Alloy. ANSI B16.22
    - 3) Refrigerant Piping. ANSI B31.5, ANSI B36.40, ASTM A333
    - 4) Copper tube (drain, vent) DWV. ASTM B306
  - c. Non-metallic Pipe and Fittings:
    - 1) PVC Sewer Pipe and Fittings, Type PSM (up to 6"). ASTM D3034
    - 2) PVC Sewer Pipe and Fittings, Type PSM (8", 10", 12"). ASTM D3034
    - 3) PVC Plastic Pipe Schedule 40, 80, and 120 ANSI B72.7, ASTM D1785
    - 4) PVC Plastic Pipe (SDR-PR). ASTM D2241
    - 5) Socket-type PVC Plastic Pipe Fittings Schedule 40. ASTM D2466
  - d. Pipe Joining Materials, Gaskets, Methods, and Accessories:
    - 1) Rubber Gaskets for Cast Iron Soil Pipe and Fittings. ASTM C564
    - 2) Hubless Soil Pipe Heavy Duty Shielded Couplings (304 Stainless Steel). ASTM C1540
    - 3) Solvent Cements for PVC Plastic Pipe and Fittings. ANSI B72.16, ASTM D2564
    - 4) Elastomeric Gaskets for Plastic Hub and Spigot Piping. ASTM F477
    - 5) Soldering and Brazing ANSI B9.1
  - e. AWWA - Standards for Plastic Water Pipe and Fittings.
  - f. NSF - National Sanitation Foundation Seal of Approval.
- B. Material shall be new domestic materials (made in the USA) of standard manufacture suitable for specified use.

- C. The Owner and A/E reserve the right to inspect, sample and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.
- D. Manufacturer shall certify materials conform to reference specifications, or specification number shall be cast into or marked on each piece.
- E. All Cast Iron soil pipe and fittings shall be labeled with the Cast Iron Soil Pipe Institute mark of quality and permanence.
- F. Manufacturers:
  - 1. The following no-hub clamp manufacturers are acceptable:
    - a. UPC Clamp-All
    - b. ANACO Husky SD 2000
    - c. Mifab
    - d. Ideal Heavy Duty
  - 2. The following gasketed pipe manufacturers are acceptable:
    - a. Charlotte Seal
    - b. Tyler Pipe Industries
  - 3. The following solder manufacturers are acceptable:
    - a. United Wire
    - b. Engelhard
    - c. Elkhart
  - 4. The following PVC and CPVC pipe manufacturers are acceptable:
    - a. NIBCO
    - b. Charlotte Pipe
    - c. LASCO
  - 5. The following cast iron pipe manufacturers are acceptable:
    - a. Tyler
    - b. Charlotte Cast Iron Pipe

c. AB&I Cast Iron Pipe

PART 2 - PRODUCTS

2.1 GENERAL:

- A. No materials shall be co-mingled within the same system except those which are specifically approved in these specifications.

2.2 PIPE SCHEDULE:

A. Building Sewer Piping, Building Storm Drain Pipes, and Plumbing Vent Piping:

1. Piping above ground shall be service weight, Cast Iron, soil pipe and fittings.
2. Piping above grade shall be no-hub type. Each joint shall consist of a housing and clamp.
3. The housing and clamp assembly shall consist of type 304 stainless steel housing, type 304 stainless steel clamps, type 305 stainless steel screws, and a one piece molded neoprene gasket.
4. Assemblies shall be provided with a minimum of two high torque clamps of 100-125 in/lbs or four clamps with a minimum rating of 80 in/lbs.
5. Housings shall be 3" wide for pipe sizes up to 4" and 4" wide for 5" thru 10" pipe sizes.
6. Piping and fittings below grade shall be Schedule 40 PVC Solid Wall with solvent welded fittings.

B. Sanitary Sewer Pipes and Storm Drain Piping, Exterior:

1. Piping installed from 5'-0" outside of building to connection with existing sanitary sewer and storm drain shall be Polyvinyl Chloride Schedule 40 Solid Wall sewer pipe and fittings.
2. Pipe and fittings shall be hub and spigot type with gasketed joints/fittings.

C. Domestic Water Piping:

1. Fittings shall be Class 150 with permanent identification markings.
2. All domestic water piping, up to 4 inches, below grade and to a point five (5) feet outside of building shall be seamless hard drawn, Type K copper pipe, with wrought copper fittings.
3. All domestic water piping, above grade shall be seamless hard drawn, Type L, copper pipe, with wrought copper fittings.

4. All exposed water piping to plumbing fixtures shall be flex stainless steel piping.
5. All cold water mains and fittings below grade from a point five feet outside of building to connection with utilities line shall be Schedule 40, Type 1 Polyvinyl Chloride (PVC).
6. At Contractors option PEX and CPVC domestic water piping can be used.

D. Relief Valve Discharge and Vent Piping:

1. Piping shall be seamless hard drawn, Type L, copper pipe.

E. Gas Piping:

1. Steel pipe shall be Schedule 40 black steel complying with ANSI B36.10 and ASTM A53 as follows:
  - a. Piping shall be threaded or have press fittings.
2. Gas piping schedule:
  - a. Underground, outside: Schedule 40 black steel or corrugated Stainless steel piping.
  - b. Above ground and inside the building: Schedule 40 black steel or corrugated Stainless steel piping.
  - c. Corrugated stainless steel shall be by Tracpipe.
  - d. Press fitting shall be submitted for approval.

F. Pressure Gauge Piping:

1. Piping on plumbing systems shall be seamless soft or hard drawn, Type L, copper.
2. Pipe shall be same size as gauge connection.

2.3 FITTINGS AND CONNECTIONS:

A. Fittings shall be the same material and weight as the pipes joined by the fitting unless noted otherwise. Fittings shall comply with all applicable standards.

B. Prohibited Fittings:

1. The following are prohibited fittings:
  - a. Bull head tee's
  - b. Street ells

- c. Bushings
  - d. Close nipples
  - e. "T" drill fittings
  - f. No mitered fittings in welded systems
- C. Welded Fittings and Pipe Connections:
- 1. All welded pipe and fittings shall be delivered to job with machine beveled ends. Where necessary, beveling may be done in filed by gas torch, in which case surfaces shall be thoroughly cleaned of scale and oxidation after beveling.
  - 2. Welded pipe shall have flanges at valves and elsewhere to permit disassembly for maintenance.
  - 3. With the exception of pipe welded end-to-end, all welded joints shall be made by the use of one-piece welding neck flanges, nozzles, elbows and tees.
  - 4. All welding elbows shall be long radius.
  - 5. Welding end fittings shall have the same bursting pressure as pipe of the same size and schedule. Tee fittings shall be one piece except that shaped nipples are permitted where branches are at least three pipe sizes smaller than the main.
- D. Flanged Fittings:
- 1. Flanges and flanged fittings shall conform to ANSI standards and ASTM standards.
- E. Cast Iron Fittings:
- 1. Fittings for sewage lines, drain lines and plumbing vents shall be the same type as the pipes joined by the fitting.
  - 2. Cast iron pipe and joints must conform to ANSI A21.1, A21.8, A21.10, and A21.11, latest revisions.
- F. Malleable Iron Fittings - Water Service:
- 1. All malleable iron fittings shall conform to ASA B16.3, B2.1 and ASTM A47 Grade 32510.
- G. Copper Pipe Fittings - Water Service:
- 1. Fittings shall be wrought copper.
  - 2. Solder used for fittings shall be zero percent lead, 200 PSI working pressure, installed as recommended by the manufacturer and applied to clean surfaces. Connections to valves and other types of piping shall be made with brass, copper

or bronze adapters, sweat type to threaded type or cast copper companion flanges. Connections to valves and other dissimilar materials shall be made with dielectric unions where hereafter specified.

3. Fittings in concealed location:
  - a. Fittings shall be brazed.
  - b. Solder shall be:
    - 1) United Wire SIL-PH0S
4. Fittings in non-concealed locations:
  - a. Fittings shall be soldered unless noted otherwise.
  - b. Solder shall be:
    - 1) United Wire SIL-PH0S
    - 2) Engelhard Silvabrite 100

H. Brass Pipe Fittings - Exposed Water Piping to Fixture:

1. Fittings shall be polished chromium plated cast brass screwed type.

I. Plastic Fittings - Potable Water Mains:

1. Fitting shall be Type I, solvent weld type.

2.4 PIPE COVERINGS:

A. Pipe Coverings:

1. Pipes not specified to be covered in the Underground Pipe Coating specification or specifically indicated elsewhere shall be covered per this section.
2. Type 1: Mechanically wrapped with asphalt primer and asphalt saturated felt or glass wrapper bonded to enamel with Asphalt Institute specification M1. Joints and pipe less than 10 feet in length may be field coated.
3. Type 2: Polyken 826 sheathing, 12 mil minimum thickness.

B. Pipe Requirements:

1. Underground Pipe - Type 1 or Type 2.
2. Pipes in contact with masonry: Type 1 or Type 2.

2.5 COMPRESSED AIR PIPES, TUBES, AND FITTINGS:

- A. Aluminum piping system: Nickel plated push connect bite ring couplings and galvanized ductile iron roll groove systems.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; Infinity Piping System and Elevation Piping System or a comparable product by one of the following:
    - a. Gardner Denver, Inc.; Quick-Lock.
    - b. Ingersoll-Rand; SimplAir.
  2. Source Limitations: Obtain aluminum piping systems and components from single source from single manufacturer.
  3. Pressure and Temperature Range: Aluminum piping and related specialties for general-service compressed-air systems operating at 220 psig or less, across a temperature range of minus 4 deg F to plus 176 deg F.
  4. Tubing: Aluminum pipe, alloy grade AA 6063-T5.
  5. Pipe Coating: Powder coated paint certified non-toxic to AAMA 603 and 605.
  6. Tubing shall be quality controlled to meet the tolerances specified by the roll groove or push-to-connect coupling manufacturer. The tubing manufacturer shall follow ISO 9001:2000 quality standards.
  7. Pipe Identification: All tubing must be powder coated in Blue for Compressed Air applications. Decal with maximum working pressure and temperature supplied with each length of pipe.
  8. Push-Connect Bite Ring Couplings, 14 mm to 63 mm: Solid-brass and nickel-plated body, high nitrile rubber O-ring seal in excess of 36-percent, and AISI Type 304 stainless-steel clamping washer.
  9. Fittings: Solid-brass and nickel-plated.
  10. Roll-Groove Couplings, 73 mm to 273 mm: Solid ductile-iron, galvanized, ASTM A 536 grade 65-45-12, nitrile rubber standard seals, and fluoroelastomer seals for high temperature applications.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Pipe shall be installed in strict accordance with manufacturer's recommendations.
- B. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all window, doors, and other openings or obstructions. Excessive cutting or other weakening of building to facilitate piping



installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs.

- C. Each length of pipe, as erected, shall be upended and rapped. Dirt and all foreign matter shall be cleaned from pipe and fittings before installation.
- D. All turns and connections shall be made with long radius fittings as specified hereinafter.
- E. Provide proper provision for expansion and contraction in all portions of pipework, to prevent undue strains on piping or apparatus connected therewith. Provide double swings at coil connections, riser transfers, and other offsets wherever necessary to take up expansion. Arrange riser branches to take up motion of riser.

### 3.2 ISOLATION VALVES:

- A. Provide shutoff valves at all major branches and at each riser.

### 3.3 BLACK STEEL PIPING:

- A. Screwed piping shall conform to the following:
  - 1. Pipe nipples - Any piece of pipe 3" in length or smaller shall be considered a nipple. All nipples with unthreaded portion 1-1/2" and smaller shall be extra heavy. Only shoulder nipples shall be used. No close nipples shall be provided.
  - 2. Screw threads shall be cut clean and true; screw joints shall be made tight without caulking. No caulking shall be permitted. A nonhardening lubricant shall be permitted. No bushings shall be used. Reductions shall be made with eccentric reducers or eccentric fittings to eliminate objectionable water or air pockets. All pipe shall be reamed out after cutting to remove all burrs.
- B. Welded piping shall conform to the following:
  - 1. All welded joints for steel pipe shall be of the open V-butt following approved welding procedures for metallic arc or oxy-acetylene carbon steel welded pipe joints. Pipe shall be mill-beveled or machine-beveled by this Trade. All scale and oxide must be removed with hammer, chisel or file, and the bevel left smooth and clean.
  - 2. Weld metal shall be thoroughly fused with base metal at all sections of weld and penetration of weld shall include unbeveled portion and shall extend to inside walls of pipe.

### 3.4 GASKETED HUB AND SPIGOT PIPING:

- A. The spigot end of the pipe shall be prepared by cleaning and applying a thin coat of adhesive lubricant.
- B. The spigot end is centered in the hub and jacked on by using a special jack and choker sling.

3.5 PIPING ARRANGEMENT:

A. Drainage and Vent Piping:

1. All horizontal drainage and vent piping shall be installed with a uniform grade. Piping 2-1/2" and less shall slope a minimum of 1/4" per foot of fall in the direction of flow. Piping 3" and larger shall slope a minimum of 1/8" per foot of fall in the direction of flow. Fall shall be greater where indicated.
2. Soil and waste vent pipes shall extend 12" minimum through roof full size except where noted otherwise. Vents through the roof shall be a minimum 3". Provide increasers as required.
3. Changes in direction or size of drainage piping shall be made with appropriate fittings having long radius. The use of short radius fittings shall be limited to points where the space limitations prevent the use of long radius fittings.
4. Slip joints shall be permitted only on trap connections. Couplings or hub drainage fittings shall be used for union connections.
5. All vertical stacks shall be supported at each floor with clamp anchors to relieve stresses. Vertical stacks shall be installed with provision for expansion.

3.6 PIPING TO EQUIPMENT:

- A. Where items in piping such as control valves, pumps, coils and equipment connections are different sizes than the piping, reducers and increasers shall be installed adjacent to such items so there is a minimum of reduced size pipe.
- B. Eccentric reducers shall be installed on suction side of pumps allowing continuous flow of air.
- C. All piping connections to coils, equipment, valves and other system components shall be made with offsets with flanges or unions so arranged that the equipment can be serviced or removed without dismantling the piping.
- D. Provide all final pipe connections to systems and equipment.

3.7 BELOW GRADE PIPE:

- A. All pipe shall be inspected before backfilling.

3.8 CONCEALED PIPE:

- A. Test all pipe prior to concealing or insulating.

3.9 SITE UTILITIES:

- A. Provide all final connections to site utilities.

- B. Gas shall extend to gas meter.
- C. Provide all site surveys, excavation, and other investigative work to determine the exact location and invert of site utilities if utilities are in place prior to construction beginning. The Contractor shall perform this work prior to installation of any affected piping systems.

3.10 PIPE INSPECTION:

- A. The Owner and A/E reserve the right to inspect, sample and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

END OF SECTION 221100

## SECTION 221123 - PLUMBING PUMPING SYSTEMS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pumps and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

- A. All control panels shall be UL listed.
- B. Manufacturers:
  1. The following in-line domestic water circulating pump manufacturers are acceptable:
    - a. Grundfos
    - b. Taco
    - c. Bell and Gossett

### PART 2 - PRODUCTS

#### 2.1 GENERAL:

- A. Pumps shall be factory painted with machinery enamel.
- B. All pump control panels shall be dead front type (power de-energized when opened).
- C. All systems specified with factory mounted control panels shall be factory prewired.
- D. Pump shall be type indicated on schedule.

## 2.2 IN-LINE CIRCULATING PUMPS:

### A. Performance:

1. Pumps shall be selected at plus or minus 20% of the pump best efficiency point.
2. The pump/capacity curve shall be continuously rising from maximum capacity up to the shutoff point.

### B. General:

1. Pumps for domestic water shall have bronze casings and shall be bronze fitted.
2. Volute shall allow servicing without disturbing piping connections. Companion flanges for threaded connections shall be provided.
3. Pump shall be designed for 175 psi working pressure and 225 degrees F.
4. Suction and discharge gauge and vent tapings shall be provided.

### C. Motor:

1. The motor shall be open, dripproof, oil lubricated, resilient mounted construction with built-in thermal overload protection (single phase motors).

### D. Shaft:

1. Shaft shall be phosphor bronze or steel with integral thrust collar for vertical mounting. Flexible coupling shall dampen starting torque and shall be self-aligning.

### E. Impeller:

1. Impeller shall be hydraulically and dynamically balanced and keyed to the shaft.

### F. Seal:

1. The seal shall be mechanical with a carbon steel ring and ceramic seat.

## PART 3 - EXECUTION

### 3.1 RELIEFS, DRAINS AND VENTS:

- A. Pipe 3/4" drains from all pump drain pans to the nearest floor drain.
- B. Pipe relief and vents through roof or as shown on plans.

3.2 ALIGNMENT:

- A. Final alignment for base mounted pumps shall be done after piping is completed and base has been grouted, before start-up by manufacturer's representative. Alignment shall be made with dial indicator to a tolerance of  $+.002"$ . Report of alignment and start-up shall be submitted to A/E.
- B. After completion of installation and realignment, rust and scale shall be removed from exposed surfaces of pump shafts. After cleaning shaft surfaces, a protective spray coating of lubricant/rust inhibitor shall be applied to the exposed to sight shaft surfaces.

3.3 SEALS:

- A. Seals to be replaced without charge if faulty operation or unusual wear occurs not caused by improper maintenance during guarantee period.
- B. Each pump shall be provided with a spare mechanical seal. The spare seals shall be packaged in the original carton from the factory and shall be delivered to the Owner at the time of the final inspection. Each spare seal shall be labeled to identify the seal by pump number.

3.4 IMPELLER:

- A. After testing and balancing has been performed, the contractor shall provide a second impeller for each pump system as recommended by the Test and Balance Agency to meet design conditions.

END OF SECTION 221123

## SECTION 223400 - FUEL FIRED DOMESTIC WATER HEATERS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of water heaters and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

- A. Codes and Standards:
  - 1. All equipment shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
    - a. UL Code 174 Safety Standards
    - b. Underwriters Laboratories 795 - Standard for Commercial - Industrial Gas Fired Heating Equipment
    - c. Underwriters Laboratories 726 - Standard for Oil Fired Boiler Assemblies
    - d. NFPA 58
    - e. Kemper
    - f. ANSI Z21.13 - Gas Fired Low Pressure Steam and Hot Water Heating Boilers
    - g. ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
    - h. ASME - CSD-1
    - i. GE Global Asset Protection

- B. All pipe, pipe fittings and vessels shall be constructed in accordance with ASME standards.
- C. Manufacturer:
  - 1. The following water heater manufacturers are acceptable.
    - a. Intellihot
    - b. Rennai

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Provide water heaters with burner, controls, regulators, accessories and factory wiring so that only power connection, vent connection, and piping is required in the field.
- B. Equipment shall exceed scheduled efficiencies or ASHRAE 90.1, whichever is greater.
- C. The physical dimension of the water heaters shall allow installation in space shown on plans without removal of doors or walls and only minor disassembly (i.e. removal of energy module.) Maximum width 34”.
- D. Water heaters shall be ultra efficient, heating immediately to the desired temperature all incoming cold water starting at 0.5 gpm. Modulation shall go down to 30,000 BTU.
- E. Water heaters shall be factory packaged, insulated, enamel steel jacketed, mounted on steel skids, and bear UL or ETL label.

### 2.2 CONSTRUCTION:

- A. Heat exchanger shall be
  - 1. ASME stamped for 160 psi.
  - 2. Made of 316 L stainless steel
  - 3. Single pass finned coil that is not subject to thermal shock and is self descaling.
- B. Power burner shall be combination natural and LP. Burner shall be capable of operating with 2.5” gas pressure.
- C. Redundancy shall be provided with each water heater containing two or more power burners and heat exchangers.
- D. Controls shall insure that each burner operates an equal amount of time and should there be a single failure, the others will continue to operate.



E. Relief Valve:

1. Water heater manufacturer shall supply an ASME rated T&P relief valve.

F. Fittings:

1. All fittings connecting to the piping system shall be copper dielectric unions.

2.3 EXHAUST VENTING AND COMBUSTION AIR:

- A. Exhaust vent material shall be Schedule 40 PVC.
- B. Combustion air material shall be Schedule 40 PVC or galvanized metal.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Relief lines shall be run full size to a floor drain, service sink, or outside the building.
- B. Condensate line off of exhaust vent shall be piped to a neutralization kit and then piped to nearest floor drain. Condensate line shall be sloped a minimum of 1/8" per foot towards neutralization kit and floor drain.
- C. Exhaust vent shall extend up thru the roof and provided with a 90° elbow turned down installed a minimum of 18" above finished roof level. Provide roof curb and appropriate flashing for exhaust vent penetrating roof.
- D. Combustion air shall extend thru wall with a 90° elbow turned down with screened outlet.

3.2 INITIAL START-UP:

- A. Water heater shall be inspected and started by an authorized factory representative.

3.3 WARRANTY:

- A. Water heaters:
  1. Heat exchangers shall carry a 6 year non-prorated warranty without any restriction regarding use in a constantly circulating system. This warranty shall include labor and freight.

END OF SECTION 223400

## SECTION 224011 - PLUMBING ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the plumbing system, accessories and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:
  - a. South Carolina Department of Health & Environmental Control.
  - b. Plumbing and Drainage Institute Standard No. WH201 "Standard for Water Hammer Arresters."
  - c. Plumbing and Drainage Institute Standard No. G-101 "Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance."
  - d. ASSE Standard 1010-2004 "Performance Requirements for Water Hammer Arresters."
  - e. ASTM C1613 "Standard Specification for Precast Concrete Grease Interceptor Tanks"
  - f. American Concrete Institute (ACI)

##### B. Manufacturers:

1. The following floor drain manufacturers are acceptable:
  - a. Mifab

- b. J. R. Smith
  - c. Wade
  - d. Josam
  - e. Zurn
  - f. Watts
2. The following clean out manufacturers are acceptable:
- a. Mifab
  - b. J. R. Smith
  - c. Wade
  - d. Josam
  - e. Zurn
  - f. Watts
3. The following backflow preventer manufacturers are acceptable:
- a. Apollo
  - b. Conbraco
  - c. Watts
4. The following water hammer arrester manufacturers are acceptable:
- a. Mifab
  - b. J. R. Smith
  - c. Sioux Chief
  - d. Watts
  - e. Zurn
5. The following trap seal primer device manufacturers are acceptable:
- a. Mifab
  - b. Precision Plumbing Products
  - c. Josam

6. The following trap seal protection device manufacturers are acceptable:
  - a. SureSeal Manufacturing; Inline Floor Drain Trap Sealer

## PART 2 - PRODUCTS

### 2.1 FLOOR DRAINS (FD-X):

- A. Provide floor drains at locations shown on drawings.
- B. Each drain shall be provided with a cast iron p-trap. Provide full size of drain outlet.
- C. Trap seal primers shall be provided where indicated on drawings. Provide trap seal protection devices for all floor drains and floor sinks.
- D. Vandal proof screw where stated shall be Torx security pin type screw.
- E. Provide membrane clamp (-C) in floor areas with waterproofing membrane.
- F. All strainer tops to be reinforced to prevent cupping.
- G. Outlet connections for floor drains installed at grade level shall be push-on. Contractor's option for outlet connection type for floor drains installed above grade.
- H. Floor drains shall be:
  - FD-1: General Purpose Floor Drains (Toilets, Water Heater Rooms): Mifab Series F1000-S6-3-7 cast iron drain with 6" square adjustable reinforced stainless-steel top for tile floor with trap seal primer tapping or Mifab Series F1000-3-7 cast iron drain with 6" round adjustable reinforced stainless steel top for concrete floor with trap seal primer tapping.

### 2.2 CLEANOUTS:

- A. Provide cleanouts at locations shown on plans and at all bends, angles, upper terminals and each one hundred feet of pipe run.
- B. All Cleanouts to have full opening 4" access. Floor cleanouts to be provided with plastic/ABS countersunk regular slotted plugs lubricated with non hardening thread lubricant.
- C. Flush-with-floor cleanout tops shall have non-skid covers.
- D. Flashing flange with device required on membrane floors.
- E. Outlet connections for floor cleanouts installed at grade level shall be push-on. Contractor's option for outlet connection type for floor cleanouts installed above grade.

F. Cleanouts shall be:

1. Finished Room Floors (Round Top): Mifab Series C1000 -R-3 (round top) cast iron adjustable floor level cleanout assembly with stainless steel top.
2. Finished Room Floors (Square Top): Mifab Series Mifab Series C1000- S-3 (square top) cast iron adjustable floor level cleanout assembly with stainless steel top.
3. Unfinished Floors: Mifab Series C1100-XR-4 all cast iron adjustable floor level cleanout assembly with round heavy duty ductile iron top.
4. Yard Areas: Mifab Series C1300-MF w/C1230 cast iron concrete surface level cleanout assembly with lifting device.
5. Aboveground Caulk Ferrule Cleanouts: Mifab Series C1460-RD cast iron ferrule with 6" diameter stainless steel cover. Mifab Series C1460 for plug only.

2.3 VACUUM BREAKERS:

A. Vacuum breakers shall be constructed as follows:

1. Body shall be chrome plate brass.
2. Retainer tube screen, cap and collar shall be stainless steel.
3. Ball check shall be stainless steel.
4. Seat shall be resilient "O" ring.
5. Size shall be line size or as indicated on drawing.

B. Vacuum breakers shall be installed on all flush valves, service sinks, mop sinks, hose bibbs, wall hydrants, hose reels, threaded hose connections, any devices which can be installed or placed below a fixture flood rim, and elsewhere as specified.

C. Dishwashers shall be provided with a satin chrome lead free anti-siphon, spill-resistant vacuum breaker. Vacuum Breaker shall be Watts LF008PCQT or equal.

2.4 BACKFLOW PREVENTERS:

A. Backflow preventers shall be approved by University of Southern California's Foundation for Cross Connection Control and Hydraulic Research (USC-FCCCHR) and local authority's approved manufacturer list.

B. Provide an approved backflow prevention device (double check valve backflow preventer unless noted otherwise) at all points of possible backflow into potable water mains, as shown on plans and as follows:

1. At entry into building.

2.5 WATER HAMMER ARRESTERS:

- A. Water hammer arresters shall be installed on both hot and cold water lines.
  - 1. Size by fixture unit rating of Plumbing and Drainage Institute (PDI).
  - 2. Select the next larger water hammer arrester when water pressure in line exceeds 65 PSI.
  - 3. Water hammer arresters shall conform to ASSE 1010-2004.
- B. Water hammer arresters shall be permanently sealed, tested to 5000 cycles and 125 PSI working pressure. Water hammer arrestors shall be suitable for installation in concealed locations without requiring access panels.
- C. Provide a water hammer arrester at the following locations:
  - 1. Flush valves (water closet/urinal):
    - a. Single fixture.
    - b. When in a battery and up to twenty (10) feet at the end of the branch line between the last two (2) fixtures.
  - 2. Quick closing valves.
  - 3. Hand washing station and wash fountains.
- D. Water hammer arresters shall be, or equal to:
  - 1. Mifab MWH Series
  - 2. J. R. Smith No. 5000 Series Hydrotrol
  - 3. Sioux Chief No. 650 Series Hydra-Rester
  - 4. Watts No. 15M2 Series Water Hammer Arrester
  - 5. Zurn 1700 Series

2.6 TRAP SEAL PRIMERS:

- A. Trap seal primer shall be pressure drop type configuration and shall be tested and certified to ASSE 1018 standard.
- B. Trap seal primer shall be installed on cold water line where shown on drawings and shall operate on a minimum pressure drop of 5 psi to deliver water to trap(s).
- C. Provide distribution manifold to allow one trap seal primer to serve multiple (maximum of four) floor drains.

- D. Install trip seal primer in accordance with manufacturer's recommendations.

#### 2.7 TRAP SEAL PROTECTION DEVICES:

- A. Device shall be barrier type configuration and shall be tested and certified to ASSE 1072 Standard "Performance Requirements for Barrier Type Floor Drain Trap Seal Protection Devices".
- B. Body: ABS Plastic
- C. Diaphragm & Sealing Gasket: Neoprene Rubber
- D. Size: 2 inch, 3 inch, 3-1/2 inch, or 4 inch.
- E. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.
- F. Provide at each floor drain or floor sink connection whether or not the floor drain or floor sink is specified with a trap seal primer.

### PART 3 - EXECUTION

#### 3.1 TEMPORARY PLUMBING FACILITIES:

- A. Temporary toilet facilities, and water for construction purposes shall be as specified in Division 1 all to be provided by General Contractor. This Contractor shall cooperate to connect building facilities where required by Architect/Engineer to expedite progress of the work.

#### 3.2 FLOOR DRAINS:

- A. All drains above grade shall be flashed with 4 lb. sheet lead clamped under flashing ring extending 18" from drain in all directions, lead shall be mopped to structural deck.
- B. All drains shall be provided with deep seal p-traps.
- C. Set drains to provide drainage of surrounding areas.

#### 3.3 TRAP SEAL PRIMERS:

- A. Install trip seal primer in accordance with manufacturer's recommendations.
- B. Insure that piping is properly flushed prior to connecting trap seal primer and distribution unit (when required).
- C. Cycle trap seal primers a minimum of six (6) times to ensure optimum performance.

#### 3.4 TRAP SEAL PROTECTION DEVICES:

- A. Trap seal protection devices shall be installed at trim out stage of project and not before.

3.5 VACUUM BREAKERS:

- A. Vacuum breaker shall be installed per code and 6" above floor rim, whichever requirement is most stringent.

3.6 WATER HAMMER ARRESTERS:

- A. Water hammer arresters shall be installed in an upright position.

3.7 STERILIZING AND CLEANUP:

- A. After system has been installed completely, Contractor shall clean all fixtures removing all plaster, labels, etc. All water piping shall be sterilized in accordance with these specifications.

3.8 INSPECTIONS, TESTS, AND ADJUSTMENTS:

- A. During progress and after completion of the work included under this specification, Contractor shall make all required tests at his own expense in presence of Architect/Engineer as follows and in accordance with local codes. Contractor shall furnish all testing instruments, gauges, pumps, etc.
- B. All materials shall, so far as possible, be subjected to standard tests by manufacturers before shipment.
- C. All tests shall be conducted in accordance with System Test And Start-Up specification.
- D. Upon completion of work, Contractor shall obtain and turn over to the Architect certificates of inspection and approval from all City and State Authorities having jurisdiction.

3.9 BACKFLOW PREVENTERS:

- A. Backflow preventers installed above ceilings shall be observable from floor level when lay-in ceiling tile is removed where installed above accessible ceilings or when ceiling access door is accessed when installed above a non-accessible ceiling. Contractor shall provide access door per requirements of Section 21 0501.
- B. Submittals:
  - 1. Submit all backflow preventers to the local utility company for approval before submittal to A/E.
  - 2. Submittal to utility company shall include a description of the intended application of each device.
  - 3. Submittal to A/E shall include a copy of the letter of approval from the utility company to the contractor.

END OF SECTION 224011



## SECTION 224013 - PLUMBING FIXTURES (GENERAL)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
  - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
  - b. Staple Vitreous China Plumbing Fixtures
  - c. U. S. Department of Commerce CS 20-49, CS 77-48.
  - d. WW-P-542 Formed Steel Fixtures

##### B. Manufacturers:

1. The following emergency eyewash equipment manufacturers are acceptable:
  - a. Haws
  - b. Acorn
  - c. Bradley
  - d. Speakman
  - e. Guardian
2. The following wall hydrant and hose bibb manufacturers are acceptable:
  - a. Woodford Manufacturing Company
  - b. MIFAB
  - c. Josam

## PART 2 - PRODUCTS

### 2.1 WALL HYDRANTS:

- A. Wall hydrant minimum supply 3/4" with backflow preventer and vacuum breaker.
- B. Fixtures shall be:
  - P-7 Wall Hydrant: Wall mounted, 24" above finish grade.  
Fixture: Woodford Model 67 backflow protected automatic draining freezeless wall hydrant. ASSE Standard 1052 approved.

### 2.2 HOSE BIBBS:

- A. Hose bibb minimum supply 3/4" with backflow preventer and vacuum breaker.
- B. Fixtures shall be:
  - P-6 Hose Bibb Fixture: Wall mounted, 24" above finish floor.  
Fixture: Woodford model polish chrome finish 26PC backflow protected with loose key hose bibb. ASSE Standard 1052 approved.

### 2.3 EMERGENCY EYE WASH:

- A. Minimum supply connection shall be:
  - 1. 1/2" for eyewash.
- B. Fixtures shall be:
  - P-8 Emergency Eye Wash: Wall mounted.  
Fixture: Stingray model T2235-P Wall mounted barrier Free Eyewash.  
Remark: Eye wash shall have exposed P-Trap.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. General:
  - 1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
  - 2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
  - 3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of

the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.

4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

### 3.2 FIXTURE MOUNTING HEIGHTS:

#### A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

### 3.3 FIXTURE SUPPORTS:

#### A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

### 3.4 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.
- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 224013

## SECTION 224100 - PLUMBING FIXTURES (SINKS AND LAVATORIES)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
  - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
  - b. Staple Vitreous China Plumbing Fixtures
  - c. U. S. Department of Commerce CS 20-49, CS 77-48.
  - d. WW-P-542 Formed Steel Fixtures

##### B. Manufacturers:

1. The following wash station manufacturers are acceptable:
  - a. Elkay
  - b. Bradley
  - c. Acorn
  - e. Willoughby
  - f. Advance Tbaco

2. The following floor mounted service sink manufacturers are acceptable:
  - a. Sterns-Williams Company
  - b. Fiat Products, Inc.
  - c. Creative Industries
  - d. Acorn
  
4. The following manual faucet and handle manufacturers are acceptable:
  - a. T&S Brass and Bronze Works, Inc.
  - b. Toto
  - c. Chicago
  - d. Delta
  - e. Speakman
  - f. Symmons
  - g. Moen
  - h. Zurn
  
5. The following sensor faucet manufacturer are acceptable:
  - a. Toto
  - b. Kohler
  - c. Elkay
  
6. The following fixture trim manufacturers are acceptable:
  - a. Kohler Company
  - b. McGuire Manufacturing Company
  - c. Brass Craft
  
7. The following handicapped insulation manufacturers for lavatories are acceptable:
  - a. TrueBro
  - b. McGuire Pro-Wrap

## PART 2 - PRODUCTS

### 2.1 PLUMBING FIXTURES AND FIXTURE TRIM:

#### A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. All wall hung fixtures shall have carriers.
4. Provide lavatories with angle stops. Provide all other plumbing fixtures with either angle or straight stops.
5. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
6. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.
7. Color of fixtures shall be white unless specifically noted otherwise.

#### B. Handicap Sinks and Lavatories:

1. Provide TrueBro Model 102W (White) p-trap, hot water and cold water angle valve insulation and fasteners. Handi Lav-Guard insulation kit. (Provide No. 105W accessory with No. 102 for offset p-trap.) (Approved Equal: McGuire Pro-Wrap Model PW 2125 (White).

### 2.2 LAVATORIES (GENERAL):

- A. Minimum connections shall be 3/8".
- B. Enameled cast iron unless stated otherwise.
- C. Lavatories mounting heights shall be as listed on sheet P001.
- D. Sensor faucets shall have minimum 10 years of battery life.
- E. Fixtures shall be:

P-3 lavatory station (Handicapped): Wall hung, 3 station, 84" x 22".

Fixture: Bradley Express model MG3-IRP-NSD-PMA-S-Poly. Battery powered. Infrared, No soap dispenser, ASSE approved mixing valve, Polypropylene drain assembly. Mounted at 34" from finish floor to fixture rim.

Fitting: Part of fixture.

Drain: Part of fixture.

Supply: McGuire model 2165 LK.

P-Trap: Part of fixture.

Remarks: Color selected by Architect.

P-3A Lavatory station (Handicapped): Wall hung, 2 station, 54" x 22".

Fixture: Bradley Express model MG2-IRP-NSD-PMA-S-Poly. Battery powered. Infrared, No soap dispenser, ASSE approved mixing valve, Polypropylene drain assembly. Mounted ay 34" from finish floor to fixture rim.

Fitting: Part of fixture.

Drain: Part of fixture.

Supply: McGuire model 2165 LK.

P-Trap: Part of fixture.

Remarks: Color selected by Architect.

P-3B Hand washing sink (Handicapped): Wall hung, 72" x 20" x 8".

Fixture: Elkay stainless steel model EWMA7220SACC.

Fitting: Part of fixture. Battery powered.

Drain: Elkay LK18B perforated strainer, 1-1/2" tailpiece.

Supply: (3) McGuire model 2165 LK. One for each faucet.

P-Trap: McGuire model 8912 - 1-1/2" p-trap.

Remarks: Provide ASSE 1070 Approved mixing valve of supply piping to fixture.

## 2.3 SERVICE SINK:

A. Service sink minimum connection shall be 3/4 inch.

B. Fixtures shall be:

P-4 Service Sink Basin: Floor mounted, 32" x 32" x 12" Cornaro with stainless steel cap.

Fixture: Stern-Williams, SBC-1725.

Fitting: Stern-Williams, T-15-VB with integral stops, hook, V.B. and brace, polished chrome. Mounting height 36" finish floor to nozzle.

Drain: Stern-Williams, chrome plated strainer.

Accessories: Stern-Williams, T-40 stainless steel mop hanger, T-35 hose and wall hook and BP splash catcher panels of 20 gauge type 304 stainless steel.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

##### A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

#### 3.2 FIXTURE MOUNTING HEIGHTS:

##### A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

##### B. Lavatories:

1. Refer to Sheet P001 for fixture heights.

#### 3.3 FIXTURE SUPPORTS:

##### A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.



- B. Lavatories and sinks mounted on stud walls:
1. Install a 1/4" thick by 6" wide steel plate which shall extend at least one stud beyond the first and last fixture mounting points.
  2. In wood stud construction, the plate shall be securely attached to each stud which it crosses with two (2) 1/2" steel bolts on 4" centers with 1/8" thick by 1-1/2" wide by 6' long steel backup plates.
  3. In steel stud construction the plate shall be attached to each stud which it crosses by 1/8" fillet weld across the full width of the steel stud flange or plate and support carrier J.R. Smith 800.
  4. Fixture or supporting arms shall be securely and firmly attached to the steel plate in accordance with the manufacturer's instructions.
  5. Lavatories shall be punched for Smith No. 723 concealed arm fixture support. The arms shall be securely bolted to the steel backing plate in the wall as hereinbefore specified. They shall have positive mechanical locking device and shall be fully adjustable after installation of the finished wall.
- C. Lavatories and sinks mounted on block walls.
1. Lavatories shall be punched for Smith No. 700 fixture support. Fixture support shall have concealed arms with positive mechanical locking device. Arms shall be fully adjustable after installation of finished wall. Uprights shall be high strength steel with block bases securely bolted to floor construction.
  2. Heavy sinks shall be mounted on Smith No. 871 fixture support with porcelain enamel exposed arms. Uprights shall be high strength steel with block bases securely bolted to floor construction.

3.4 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.
- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 224100

SECTION 224300 - PLUMBING FIXTURES (WATER CLOSETS AND URINALS)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
  - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
  - b. Staple Vitreous China Plumbing Fixtures
  - c. U. S. Department of Commerce CS 20-49, CS 77-48
  - d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following water closet manufacturers are acceptable:
  - a. Kohler Company
  - b. Toto
  - c. Zurn
  - d. American standard

2. The following urinal manufacturers are acceptable:
  - a. Kohler Company
  - b. Toto
3. The following flush valve manufacturers are acceptable:
  - a. Toto
  - b. Kohler
  - c. Hydrotek
  - d. Moen
4. The following water closet seat manufacturers are acceptable.
  - a. Sperzel Company
  - b. C. F. Church Company
  - c. Beneke Corporation
  - d. Olsonite Corporation
  - e. Bemis
  - f. Toto
  - g. Kohler

## PART 2 – PRODUCTS

### 2.1 PLUMBING FIXTURES AND FIXTURE TRIM:

#### A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. All wall hung fixtures shall have carriers.
4. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
5. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.

6. Color of fixtures shall be white unless specifically noted otherwise.
7. Provide flush valve support for all flush valves.

## 2.2 WATER CLOSETS:

- A. Minimum connection shall be 1 inch.
- B. Seat shall be white unless stated otherwise.
- C. Handicapped water closet locate flush valve handle on the wide side of fixture.
- D. Secure all flush valves to wall with wall bracket.
- E. Water closets shall be:

P-1 Water Closet: Floor mounted, 15" finish floor to top of rim.

Fixture: ToTo, model CT705ENG#01, 1.6 GPF.

Valve: Toto, TET1GA32#CP, Eco power piston toilet flush valve, 1.6 GPF.

Seat: Beneke, 527 SS (White).

Bolt Caps: Supplied with water closet.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

P-1A Water Closet (Handicapped): Floor mounted, 18" finish floor to top of rim.

Fixture: ToTo, model CT705ELNG#0, 1.6 GPF.

Valve: Toto, model TET1GA32#CP, Eco power piston toilet flush valve, 1.6 GPF.

Seat: Beneke, 527 SS (White).

Bolt Caps: Supplied with water closet.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

## 2.3 URINALS:

- A. Minimum connection shall be 3/4 inch unless stated otherwise.
- B. Urinal mounting heights shall be as listed for each fixture.
- C. Handicapped urinal locate flush valve handle on the wide side of fixture.
- D. Secure all flush valves to wall with wall bracket.

- E. All sensor type flush valves shall have shall have min. 10 years of battery life.
- F. Urinals shall be:
- P-2 Urinal: Wall hung, 24" finish floor to top of rim, urinal carrier and wall bolts and metal strainer.
- Fixture: Toto, model UT105U, Top Spoud Urinal 0.5 GPF.
- Valve: Toto, Eco power, self-generating sensor type flush valve, model TEU1LN12#12, 0.5GPF.
- Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.
- P-2A Urinal (Handicapped): Wall mounted, Dexter, 17" finish floor to top of rim, urinal carrier and wall bolts and metal strainer.
- Fixture: Toto, model UT105U, Top Spoud Urinal 0.5 GPF.
- Valve: Toto, Ecopower, self-generating sensor type flush valve, model TEU1LN12#12, 0.5GPF.
- Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. General:
1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
  2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
  3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
  4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
  5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS:

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

B. Water Closets:

1. Mount all water closets at 15" top of rim to floor.
2. Mount all handicapped water closets at 17" minimum - 19" maximum top of toilet seat to floor.

C. Urinals:

1. Mount all urinals at 24" from floor to lip.
2. Mount all handicapped urinals 17" from floor to lip.

3.3 WATER CLOSETS:

- A. Make joints between earthenware fixtures and soil pipe by means of flange compatible to pipe. Joint shall be gastight and watertight.
- B. Set all floor type water closets with a "no-step" sleeve gasket as manufactured by William H. Harvey Company.

3.4 FIXTURE SUPPORTS:

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

B. Wall hung blowout and washout urinals:

1. Smith No. 634, 635, 636, and 637 urinal support. Uprights shall be high strength steel with block bases securely bolted to floor construction.

3.5 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 224300

SECTION 224400 - PLUMBING FIXTURES (WATER FOUNTAIN AND WATER COOLERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:
  - a. A Sanitary Cast Iron Enameled Ware Commercial Standard
  - b. Staple Vitreous China Plumbing Fixtures
  - c. U. S. Department of Commerce CS 20-49, CS 77-48.
  - d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following water fountain and water cooler manufacturers are acceptable:
  - a. Elkay Manufacturing Company
  - b. Haws Drinking Faucet Company
  - c. Halsey Taylor



2. The following fixture trim manufacturers are acceptable:
  - a. Kohler Company
  - b. McGuire Manufacturing Company
  - c. Engineered Brass Company (EBC)
  - d. Brass Craft

## PART 2 – PRODUCTS

### 2.1 PLUMBING FIXTURES AND FIXTURE TRIM:

#### A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
2. All wall hung fixtures shall have carriers.
3. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
4. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.

### 2.2 DRINKING FOUNTAIN (STANDARD):

- A. Minimum supply connection shall be 3/8".
- B. For mounting height refer to sheet P001.
- C. Fixtures shall be:

P-6 High & Low Electric Water Cooler with bottle filling station (Handicapped): Wall mounted, 36" wide x 19" deep. Bottel filler to be located on lower ADA cooler.

Fixture: Elkay, EMABFT8WS - stainless steel, vandal resistant, (completely lead free material) pushbar--no solenoid.

Supply: Kohler, K-7606 with stop.

P-Trap: Kohler, K-9000 1-1/2" p-trap.

P-6A Electric Water Cooler with bottle filling station (Handicapped): Wall mounted, 19" wide x 19" deep.

Fixture: Elkay, EMABFT8WSS- stainless steel, vandal resistant, (completely lead free material) pushbar--no solenoid.

Supply: Kohler, K-7606 with stop.

P-Trap: Kohler, K-9000 1-1/2" p-trap.

## 2.3 INSTALLATION:

### A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

## 2.4 FIXTURE MOUNTING HEIGHTS:

### A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with Sheet P0.1.

## 2.5 FIXTURE SUPPORTS:

### A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

- B. Drinking fountains mounted on stud walls:
  - 1. Install a 1/4" thick by 6" wide steel plate which shall extend at least one stud beyond the first and last fixture mounting points.
  - 2. In wood stud construction, the plate shall be securely attached to each stud which it crosses with two (2) 1/2" steel bolts on 4" centers with 1/8" thick by 1-1/2" wide by 6' long steel backup plates.
  - 3. In steel stud construction the plate shall be attached to each stud which it crosses by 1/8" fillet weld across the full width of the steel stud flange or plate and support carrier J.R. Smith 800.
  - 4. Fixture or supporting arms shall be securely and firmly attached to the steel plate in accordance with the manufacturer's instructions.
  
- C. Drinking fountains mounted on block walls.
  - 1. Water coolers shall be mounted on Smith No. 830 floor mounted water cooler support. Uprights shall be high strength steel with block bases securely bolted to floor construction.

2.6 CLEANING:

- A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.
- B. Fixtures shall be cleaned spotless before final inspection.
- C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION 224400

## SECTION 230501 - GENERAL HVAC REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. The Heating, Ventilation, and Air Conditioning (HVAC) work shall include, but not be limited to, the following:
  - 1. Piping for HVAC system
  - 2. Heating systems
  - 3. Air Conditioning
  - 4. Air Distribution
  - 5. Controls and Instrumentation
  - 6. Balancing of Air Systems

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 DELINEATION OF WORK:

- A. Provide all necessary coordination of information to installers who are performing work to accommodate Division 23 installations.
- B. Where the Division 23 installer is required to install items which they do not purchase, they shall include for such items:
  - 1. The coordination of their delivery.
  - 2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
  - 3. Their safe handling and field storage up to the time of permanent placement in the project.
  - 4. The correction of any damage, defacement or corrosion to which they may have been subjected.
  - 5. Their field assembly and internal connection as may be necessary for their proper operation.

6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
  7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
- C. Items which are to be installed by the Division 23 installer but not purchased as part of the work of Division 23 shall be carefully examined upon delivery to the project. The Division 23 installer shall provide all work necessary to properly install these items.
- D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the A/E shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the A/E.

#### 1.4 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.
- B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- C. All equipment of one type (such as fans, valves, grilles, etc.) shall be the products of one manufacturer unless specifically stated otherwise.
- D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
- E. All materials with a manufacturers listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

#### 1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.

- B. Where Codes and Standards are referenced, they shall be the date stated in these specifications or on the drawings. If none stated, they shall be the latest edition.
- C. All work shall conform to the following Building Codes:
  - 1. International Building Codes
  - 2. National Fire Protection Association
- D. All work shall conform to all federal, state, and local ordinances.
- E. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:
  - 1. Factory Mutual Laboratories (FM)
  - 2. Underwriters Laboratories, Inc. (UL)
- F. All fuel fired equipment shall meet the requirements of the insurers and agencies listed and also meet the owner's insurer requirements.

#### 1.6 STANDARDS AND PROCEDURES

- A. All work shall meet or exceed the standards and procedures of the following:
  - 1. ADC: Air Diffusion Council
  - 2. AGA: American Gas Association
  - 3. AMCA: Air Moving and Conditioning Association, Inc.
  - 4. ANSI: American National Standards Institute
  - 5. ARI: American Refrigeration Institute
  - 6. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
  - 7. ASME: American Society of Mechanical Engineers
  - 8. ASTM: American Society of Testing and Materials
  - 9. MSS: Manufacturers Standardization Society
  - 10. NEMA: National Electrical Manufacturer's Association
  - 11. OSHA: Occupational Safety & Health Administration
  - 12. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

13. IRM: Improved Risk Mutuals

1.7 APPROVAL OF SUBSTITUTIONS:

- A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the A/E shall be final and bind all parties concerned.
- B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to bid opening date to the A/E. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.
- C. Approval of the A/E to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.
- D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the A/E, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS:

- A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.
- B. Notify the A/E of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.9 EQUIPMENT CONNECTIONS:

- A. The contract documents may indicate specific electrical, duct, and piping connection locations to equipment. Each manufacturer approved for bidding may have different

connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.

- B. The Contractor shall bear all costs for required changes in connection to equipment.

#### 1.10 WORKMANSHIP:

- A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.
- B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on job site and submit others for approval when required.

#### 1.11 GUARANTEES AND WARRANTIES:

- A. General:
  - 1. Furnish to the A/E a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
  - 2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.
- B. Equipment Warranties:
  - 1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at their option, may permit the contractor to provide the required repairs on the equipment unless specified otherwise.
  - 2. The equipment manufacturer shall include a written guarantee with the closeout documentation.
- C. Duration Period:
  - 1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
  - 2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.
- D. Extended Warranties:
  - 1. Warranty periods shall be extended where specifically stated in these specifications.



2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
  3. The extended warranty time listed is time in addition to the base warranty period.
  4. The following systems or equipment shall be extended warranties:
    - a. The environmental control system shall have a one year extended warranty.
    - b. The building automation system shall have a one year extended warranty.
    - c. Variable frequency drives shall have a one year extended warranty.
    - d. All air conditioning compressors shall be provided with an extended 4-year warranty, including parts and delivery charges. Centrifugal and rotary compressors shall include motor, impeller or screw, and drive train.
- E. Non-Warranted Items:
1. Non durable replaceable items such as air filter media do not require replacement after the date of acceptance.
- F. Warranty Repair:
1. Repair shall take place as soon as possible but not later than the following:
    - a. Items not essential for facility operation - 7 days.
    - b. Items that have a small impact on facility operation - 2 days.
    - c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.
  2. The determination of the impact on the facility is solely that of the Owner and A/E.
  3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
  4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
  5. All costs associated with warranty work shall be borne by the contractor.

1.12 WELDER REQUIREMENTS:

- A. All welders shall be certified by the Welding Bureau of the Mechanical Contractors Association of America. The welders shall be certified for type of welding procedure applicable to the project.
- B. Welding shall be performed in accordance to the applicable welding procedure specification (WPS). Separate WPS are required for different welding methods and materials as set forth in ASME Boiler and Pressure Vessel Code, Section IX.
- C. Welders, welding test and welding procedures shall comply with the following:
  - 1. Applicable sections of ASME B31 standard, Code for Pressure Piping.
  - 2. ASME Boiler and Pressure Vessel Codes.
  - 3. Standard D9.1 for arc welded and braze welded duct.
- D. The different type of welding processes include, but are not limited to:
  - 1. SMAW (Shielded metal arc welding).
  - 2. GMAW (Gas metal arc welding or MIG).
  - 3. GTAW (Gas tungsten arc welding or TIG/Heliarc).
- E. The Contractor shall be prepared to provide the following tests and reports prior to beginning construction.
  - 1. Qualification test of each welder prior to beginning construction.
  - 2. One sample of welding of each welder's work selected at random by A/E if requested during construction period.
- F. Submit welder qualifications to A/E.

1.13 EXISTING FACILITIES:

- A. The location of structure, openings and penetrations, duct, pipe, fixtures, equipment and appurtenances for existing facilities are shown on plans to indicate the extent of work required. Exact conditions shall be field verified by the contractor.

PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 PRIOR CONDITIONS:

- A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.
- B. If the prior work does not make a proper installation of any equipment or system component possible, notify the A/E prior to installation of any equipment or system component.

#### 3.2 INSTALLATION:

- A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.
- B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the A/E in writing prior to installation of equipment.
- C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the A/E in writing prior to installation of the system component.

#### 3.3 PROTECTION OF SYSTEMS AND EQUIPMENT:

- A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the A/E, at no cost to the Owner.
- B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.
- C. Piping shall be protected by storing it on elevated supports and capping the ends.
- D. During construction, all open ends of pipe, etc. which could collect construction debris shall be properly capped.

#### 3.4 CLEANING OF SYSTEMS AND EQUIPMENT:

- A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.
- B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.
- C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.

3.5 SUPPORT OF SYSTEMS:

- A. Hanging duct, piping, or equipment from un-reinforced metal roof decks (i.e., metal roof deck w/o concrete) is not permitted.
- B. The following methods of support are not permitted:
  - 1. Wire hangers unless specifically indicated
  - 2. Perforated straps
  - 3. Vinyl or plastic straps

END OF SECTION 230501

## SECTION 230502 - COMMON HVAC MATERIALS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the mechanical systems where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

- A. All work shall meet or exceed the standards and procedures (latest edition) of the following:
  1. AISC Steel Handbook
- B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.
- C. Manufacturers:
  1. The following paint manufacturers are acceptable:
    - a. Glidden
    - b. Sherwin-Williams
    - c. Devoe Paints
  2. The following caulking manufacturers are acceptable:
    - a. TREMCO
    - b. Sonneborn - Contech
    - c. W. R. Meadows

### PART 2 - PRODUCTS

## 2.1 PRODUCT REFERENCES:

- A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment.
  - 1. Filters shall be provided on all air systems to protect heat transfer components from outside air, building exhaust air or other airstreams that could foul heat transfer surfaces and elsewhere as indicated. Refer to Particulate Air Filtration specification.
  - 2. Seacoast construction shall be provided where specified for a product. Refer to Special Coating specification.

## 2.2 FLASHING:

- A. General:
  - 1. Provide flashing and counter flashing on all pipes, ducts, flues, conduits, and other mechanical system components which penetrate exterior walls or roofs.
  - 2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.
- B. HVAC Ducts:
  - 1. See detail on plans.
  - 2. Flashing of duct shall be fabricated from 20 gauge stainless steel sheets.
- C. HVAC Pipe and Conduit:
  - 1. See detail on plans.

## 2.3 DRAINS AND DRAIN PANS:

- A. General:
  - 1. Drain shall be full size of connections, size indicated on drawings, or 3/4" minimum, whichever is largest.
- B. Equipment and Miscellaneous Drains:
  - 1. Provide drains with deep seal p-trap for all equipment provided with drain connections, where drain connections are indicated on the drawings, and when drains required for proper operation of a system.
- C. Auxiliary Drain Pans:
  - 1. All equipment with condensing coils not located in mechanical rooms with floor drains shall be provided with auxiliary drain pans.

D. Drain Pans (Over Electrical Equipment):

1. Provide 20 gauge galvanized drain pan with drain connection under all pipe located within three feet horizontally of any electrical panels, switchboards, or transformers.
2. Drain pan shall have soldered or welded corners and shall be 2" deep and extend 12" past pipe and 36" beyond electrical equipment.

2.4 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.
- B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.5 FASTENERS, ANCHORS, AND ACCESSORIES:

- A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic and manufactured in the United States.
- B. Materials provided shall be considered industry standard for commercial or industrial use.
- C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.
- D. Materials installed outdoors, in attics, in crawl spaces, in tunnels and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.
- E. Unless otherwise specified or required by the manufacturer, bolts shall meet or exceed the following strengths:
  1. Proof Load: 74 ksi
  2. Yield Strength: 81 ksi
  3. Tensile Strength: 105 koi

2.6 SEALANT:

- A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.
- B. Penetrations and fire rated assemblies shall meet the requirements of the Firestopping and Smokestopping specification.

- C. Color shall be approved by A/E.

2.7 EXTRA FAN SHEAVE AND BELTS:

- A. Provide one extra fan sheave and one extra belt set for each belt driven fan.
- B. The sheaves and belts shall be similar to the original supplied sheaves and belts and shall be selected by the sheave manufacturer.
- C. The sheaves shall not be selected where the fan operates at a speed exceeding the fan's maximum RPM or the motor's amperage rating.
- D. The sheave for fans controlled by a variable frequency drive shall be selected so that the fan can operate as close to maximum RPM as long as motor maximum FLA's are not exceeded.

2.8 VOC's (ADHESIVES, SEALANTS, AND SEALANT PRIMERS):

- A. All adhesives, sealants, and sealant primers shall meet the latest requirements of LEED or Green Globes or the following, whichever has the lower values:
  - 1. Substrate Applications:
    - a. Metal to Metal - 30 g/L
  - 2. Specialty Applications:
    - a. PVC welding – 510 g/L
    - b. CPVC welding – 450 g/L
    - c. ABJ welding – 325 g/L
    - d. Plastic cement welding – 250 g/L
    - e. Adhesive primer for plastic – 550 g/L
    - f. Sheet applied rubber lining – 850 G/L
    - g. Contact adhesive – 80 g/L
  - 3. Insulation:
    - a. Duct - 50 g/L
    - b. Piping - 50 g/L
- B. The VOC limits are g/L less water.
- C. Adhesives, sealants, and sealant primers shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168.



### PART 3 - EXECUTION

#### 3.1 PAINTING:

- A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.
- B. All conditions that prohibit proper application of paint shall be reported in writing to the A/E.
- C. Submit manufacturer of paint, type, and paint color samples to the A/E for review.

#### 3.2 EQUIPMENT STORAGE:

- A. Facilities for storing materials and equipment shall be provided by the Contractor.
- B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.
- C. All stored items shall be elevated off slab or grade.
- D. Coordinate required location of all access panels with installing contractor.

#### 3.3 DRAINS AND DRAIN PANS:

##### A. General:

- 1. All horizontal gravity drain piping shall be installed with a uniform grade of not less than 1/8" per foot of fall in direction of flow except as noted otherwise.
- 2. All drain lines installed at floor in mechanical rooms shall be supported by threaded rods and pipe clamps. Rod shall be anchored into the floor slab.

##### B. Equipment and Miscellaneous Drains:

- 1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

##### C. Auxiliary Drain Pan:

- 1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

#### 3.4 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS:

- A. Run vents and reliefs to location indicated on plans or, if none indicated, to a location where they can discharge safely without presenting a hazard to personnel. Terminate with appropriate fitting.
- B. Run overflow similar to drain.

3.5 EXTERIOR SEALANT:

- A. Submit color charts to A/E.

3.6 EQUIPMENT PENETRATIONS:

- A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.7 EQUIPMENT INSTALLATION:

- A. Repair all insulation damaged during installation of equipment.

3.8 EXTRA FAN SHEAVE AND BELTS:

- A. Installation:
  - 1. Install second sheave and belts when required for the fan to meet the specified performance.

3.9 EQUIPMENT ATTACHMENT:

- A. Equipment shall be secured to the building or structure. Where equipment is provided with a method of attachment, that method shall be used to attach the equipment. Where equipment is not provided with a method of attachment, the contractor shall add gussets, angles, or similar material to the unit without affecting the performance or warranty of the equipment, which shall be used to attach the equipment.

END OF SECTION 230502

## SECTION 230508 - REQUIRED COORDINATION MEETINGS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Provide all personnel and materials necessary to discuss the issues related to coordination of the work.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.
- B. All sections of Division 23 Specifications apply to this section.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. The purpose of required coordination meetings is to minimize problems associated with the installation and operation of the mechanical system.

#### 3.2 EQUIPMENT/CONTROL COORDINATION MEETING:

- A. The following persons shall attend the meeting:
  - 1. All technical representatives of the equipment manufacturers necessary to provide in-depth understanding of the equipment control, operation, and functions.
  - 2. All technical representatives of the control installer necessary to discuss the integration of the equipment with the building automation control system.
- B. The following tasks are required to be completed prior to this meeting:
  - 1. Equipment shop drawings submitted and not returned rejected or revise and resubmit.
  - 2. The equipment supplier has provided the control installer with the equipment shop drawings.
  - 3. The equipment supplier or appropriate equipment manufacturer technical staff has reviewed with the control installer the control components and interface options for that equipment and the building automation system.
  - 4. The control installer has a good understanding of the issues related to the control of the equipment by the building automation system.

3.3 MEETING SCHEDULE:

- A. All parties shall complete the required tasks in a timely manner such that the project construction schedule can proceed without disruption or delay.
- B. If the meeting accomplishes the intended goals, a second meeting to address the same issues will not be required. If, in the A/E's opinion, the parties did not accomplish the intended goals, subsequent meeting will be scheduled as soon as practical.

END OF SECTION 230508

## SECTION 230510 - DOCUMENTATION AND CLOSEOUT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the project documentation and closeout.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. All reports, forms, and manuals shall be submitted to the A/E in triplicate unless additional copies are noted.
- B. Report, forms, and manuals are to be submitted as soon as possible, but no later than thirty (30) days after the earliest date they can be prepared.

#### 3.2 OWNER TRAINING:

- A. The contractor shall schedule the training on equipment and systems at least 21 days before training is to take place. The contractor shall provide multiple dates and times for the training to allow the Owner to coordinate the schedules of their staff to be trained.
- B. The contractor shall provide all training aids, manuals, etc. for the Owner's staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.
- C. The person providing the training shall be thoroughly knowledgeable in the subject matter.

#### 3.3 PROJECT JOB DRAWINGS AND AS-BUILT DRAWINGS:

- A. Keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, material, and equipment on the project job drawings.
- B. At the time of final inspection, one corrected set of prints shall be delivered to the A/E. All drawing costs to be by the Contractor.

- C. As built drawings shall have the information transferred from the project job drawings including all addendum, supplemental instructions, change orders, and similar information.
- D. Qualified draftsmen shall perform this task.

3.4 OPERATING AND MAINTENANCE MANUAL (MANUAL NO. 1):

- A. Compile and bind three (3) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. Provide a PDF of this information on a CD.
- B. Binder shall be hard cover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2".
- C. The spine of the binder shall be titled "HVAC Operating and Maintenance Manual, Volume No. 1," with the name of the project and the date under the title.
- D. The Operating and Maintenance Manual shall include the following:
  - 1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and contact information.
  - 2. List name, address and phone number of organization responsible for warranty work, if other than Contractor, and the specific work for which he is responsible.
  - 3. List name, address and phone number of the nearest sales and the nearest service organization for each product.
  - 4. Schedules of all equipment including identification tag numbers shown on plans cross referenced to field applied identification tag numbers.
  - 5. Performance Curves: For pumps, fans, balance valves, and similar equipment at the operating conditions.
  - 6. Lubrication Schedule: Indicating type and frequency of lubrication required.
  - 7. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.
  - 8. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
  - 9. Instruction Books: May be standard booklets but shall be clearly marked to indicate applicable equipment and characteristics.
  - 10. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.
  - 11. Automatic Controls: Diagrams and functional descriptions.

E. The following diagrams, schematics, and lists shall be provided:

1. Automatic control diagrams
2. Sequences of operation

3.5 OPERATING AND MAINTENANCE MANUAL (MANUAL NO. 2):

- A. Compile and bind three (3) sets of information indicated in this section. Provide a PDF of this information on a CD.
- B. Binder shall be hard cover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2".
- C. The spine of the binder shall be titled "HVAC Operating and Maintenance Manual, Volume No. 2", with the name of the project and the date under the title.
- D. The Operating and Maintenance Manual shall include the following:
1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and contact information.
  2. All factory test reports where factory tests specified.
  3. All start-up reports for all equipment.
  4. Test and balance report.
  5. Filter size list for each piece of equipment. Identify filter type, size, efficiency, and equipment tag.
  6. Ceiling marker schedule.
- E. When the test and balance report is over 50 pages, they shall be provided in a third manual.

3.6 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS:

- A. The A/E will review the Contractor's work periodically throughout the project. A report will be submitted to the Contractor.
- B. The reports shall be responded to within ten days of receipt by the Contractor. Each item shall be addressed with comments written on the inspection report if possible. Contractor's response shall address the status of each item and all discrepancies.

3.7 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. After all final tests and adjustments have been completed, the Owner's Representatives shall be instructed in all details of operation and maintenance for the systems installed.

- B. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.
- C. Fifty percent of instructions shall be in a formal classroom setting.
- D. Instruction shall be provided as follows:
  - 1. Equipment: Trained factory representative
  - 2. System: Competent employee of the Contractor

### 3.8 CONTROLS OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Upon completion of Operation and Maintenance instructions, the Owner's representative shall be instructed in all details of operation and maintenance for the controls installed.
- B. Controls Operation and Maintenance Instruction shall include the entire control system including control sequences that are inherent to equipment provided by the Equipment Manufacturer including economizer cycles, burner operation, low ambient operation, freezestats and similar sequences. Provide sufficient personnel equipment, walkie-talkies, gauges, and other accessories for this work.
- C. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.
- D. Fifty percent of instructions shall be in a formal classroom setting.
- E. Instruction shall be provided as follows:
  - 1. Controls System: Competent employee of the controls installer

### 3.9 ACCEPTANCE:

- A. Upon notification by the Contractor and after completion of Operation and Maintenance Instructions, the A/E will visit the project for a demonstration of the building system and an inspection of the completed work.
- B. Items which do not comply with the Contract Documents or which function incorrectly will be listed. The list will be provided by the A/E to the Contractor for correction of the installed work.
- C. After all corrections have been made, the Contractor shall notify the A/E who will recheck the systems for compliance of all items listed.

## PART 4 - STANDARD FORMS

### 4.1 GENERAL:

- A. All forms shall be completely filled out by the Contractor prior to acceptance of the project by the A/E.



4.2 HVAC CLOSEOUT LIST:

<b>HVAC CLOSEOUT DOCUMENT</b>		
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation		
BGA PROJECT NO.: 21105		
<b>DOCUMENT</b>	<b>DATE REVIEWED</b>	<b>COMMENTS</b>
Preliminary Test and Balance (Airside)		
Test & Balance (Airside)		
HVAC O&M Manual (3 sets plus CD) Vol. 1		
HVAC O&M Manual (3 sets plus CD) Vol. 2		
As installed Control Drawings		
HVAC marked-up As-Builts (1 set red lined)		
Equipment Start-Up Reports		
Filter List		
Duct Leakage Test		
Test CO/NO2 Monitors		
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.		

HVAC CLOSEOUT LIST: (Continued)

<b>HVAC CLOSEOUT DOCUMENT (Continued)</b>		
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation BGA PROJECT NO.: 21105		
<b>DOCUMENT</b>	<b>DATE REVIEWED</b>	<b>COMMENTS</b>
Punchlist dated _____		
Punchlist dated _____		
Punchlist dated _____		
Walk-Through with Owner		
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.		

4.3 HVAC INSTRUCTIONS TO OWNER:

<b>HVAC INSTRUCTIONS TO OWNER</b>					
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation BGA PROJECT NO.: 21105					
INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Controls					
Packaged Units					
100% Outside Air Units					
HVAC General					
<p>NOTE: Not all instructions may be listed. See other sections of specifications for additional requirements. Up to 8 sets of training material required. Provide per number of persons indicated. Where no minimum specified hours indicated, training shall be provided as necessary for technician to provide the Owner a good understanding of the operation, function, and maintenance requirements of the equipment or system installed.</p>					

4.4 HVAC SPARE MATERIALS:

<b>HVAC SPARE MATERIALS LIST</b>			
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation			
BGA PROJECT NO.: 21105			
ITEM	DATE DELIVERED	ACCEPTED BY	COPY OF RECEIPT SENT TO BGA
Spare Filters			
Keys			
Tools			
NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.			

4.5 INSTRUCTIONS TO OWNER:

<b>OWNER INSTRUCTIONS SIGN-IN SHEET</b>				
PROJECT: HGTC Diesel Engine Training Facility Interior Renovation				
BGA PROJECT NO.: 21105				
SYSTEM/EQUIPMENT:	DATE	TIME		LOCATION:
		START	FINISH	
INSTRUCTORS (PRINT NAME AND SIGN)				
1. _____				
2. _____				
ATTENDEES (PRINT NAME AND SIGN)				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
WRITTEN MATERIALS PROVIDED TO ALL ATTENDEES: _____ YES _____ NO				
INSTRUCTIONS IN CLASSROOM: _____ YES _____ NO				
INSTRUCTIONS IN FIELD: _____ YES _____ NO				

END OF SECTION 230510

## SECTION 230511 - SUBMITTALS

### PART 1 - GENERAL

#### 1.1 GENERAL:

- A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, the more stringent requirements shall apply.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 PREPARATION OF SUBMITTALS:

- A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and material intended for installation. Obtain all drawings and submittals from other trades as necessary to coordinate submittals.
- B. Sign all shop drawings indicating conformance with contract documents before submitting to the A/E.

#### 1.4 SUBMITTALS:

##### A. General:

1. Submittals are required on all items of equipment. They are not required on material such as sheet metal when it is not specified by a manufacturer's name.
2. Submittals shall be bound with an index identifying all types of equipment or system components included. All like items shall be grouped together.
3. Submittals shall include, but not be limited to:
  - a. All requirements of Division 1.
  - b. Complete information pertaining to appurtenances and accessories.
  - c. Information properly marked with service or function identification as related to the project.
  - d. Where the submittal consists of catalog sheets displaying other items which are not applicable, the proper features shall be clearly identified.
  - e. External connections properly marked, as related to the specific use intended, on standard factory assembly and field installation drawings.

- f. All performance characteristics and physical characteristics.
  - g. Wiring and control diagram.
  - h. All requirements listed in the specific section of specifications.
  - i. Electrical data on all motors greater than one horsepower. Data shall include horsepower unit served, power factor, efficiency and product of P.F. x EFF.
- B. Field Fabricated Components:
- 1. When field fabricated components are permitted by the specifications, scaled detailed drawings shall be submitted, clearly showing the materials used, dimensions, sizes, and means of assembly. For example, drawings shall be submitted for pump housings (insulation), support stands, etc.
- C. Submittal Summary:
- 1. A submittal summary shall be prepared by the contractor within 30 days of project award.
  - 2. The summary shall include all products and samples to be submitted along with the date the submittal will be received by the prime contractor.

#### 1.5 REVIEW OF SUBMITTALS:

- A. Review of shop drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has, in letter form, called attention to such deviations at the time of submission and secured written approval of the specific deviations.
- B. Any materials and equipment listed which are not in accordance with the equipment shown on the schedule shall be of size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Deviation from the characteristics of that equipment or layout system components will not necessarily be cause for rejection. Review of submittal does not relieve the Contractor of his responsibility. Should an installation not meet the intent of the contract documents, the Contractor may be required by the A/E to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.
- C. It is strongly recommended that the Contractor not purchase or install any equipment or system components prior to receipt of reviewed shop drawings.
- D. Reviewed with notations on the submittal shall not prohibit the Contractor from purchasing equipment. If the Contractor does not comply with the notations, the submittal shall be deemed rejected.



1.6 EQUIPMENT DIMENSIONS AND WEIGHTS:

- A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions for the equipment submitted prior to submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable by the A/E's.
- B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted prior to submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the A/E.
- C. Equipment shall not exceed maximum weight indicated on the schedules. If the equipment weight exceeds that indicated on the schedule, even where the manufacturer is an approved manufacturer, that equipment can not be bid on for this project.
- D. If equipment is not acceptable to the A/E due to dimensions or weights exceeding those indicated on contract documents, the Contractor shall accept all responsibility and costs for providing equipment that meets the dimension and weight requirements of the contract documents.

1.7 ELECTRICAL CHARACTERISTICS:

- A. Electrical characteristics for mechanical equipment are generally indicated on the mechanical documents. The electrical documents generally indicate power and wiring requirements to each piece of mechanical equipment.
- B. It shall be the mechanical installer's responsibility to verify prior to submitting shop drawings that the equipment submitted meets the electrical requirements of both the mechanical and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the A/E's attention prior to submitting shop drawings.
- C. If the discrepancy is brought to the A/E's attention prior to ordering the mechanical equipment or electrical materials associated with that equipment, the A/E will issue additional instructions to the Contractor.
- D. If the discrepancy is not brought to the A/E's attention prior to ordering the mechanical equipment and electrical materials (i.e. Contractor does not verify electrical requirements), the Contractor shall be responsible for all costs except those that would have been incurred if the discrepancy was determined prior to ordering the mechanical equipment and electrical materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRODUCT SUBMITTALS:

- A. The following list may be used as a checklist for the contractor and A/E. All products may not be listed.

**PRODUCT SUBMITTALS**

BGA NO.	PRODUCT	NO.	DATE		STATUS			ITEMS TO RESUBMIT	DATE ITEMS RESUBMITTED
			In	Out	App.	AAN	Resub.		
	100% Outside Air Units								
	Access Panels								
	Air Filters								
	Control Drawings & Sequences								
	Dampers								
	Diffusers, Registers and Grilles								
	Duct Access Doors								
	Duct Accessories								
	Duct Detectors								
	Duct Flexible Connections								
	Ductless Split Systems (AC)								
	Ductless Split Systems (HP)								
	Electric Unit Heaters								
	Fans								
	Firestop Systems								
	Gas Trains								
	Hose Reels								
	Insulation, Mastics, and Sealants								
	Metal Duct								
	Name of Test and Balance Agency								
	Paints								
	Pipe and Fitting Material								
	Pipe and Pipe Fittings								
	Pipe Hangers and Supports								
	Pipe Shields								
	Pipe Sleeves								
	Seismic Products								
	Starters								
	Variable Frequency Drives								
	Vehicle Exhaust Systems								
	Vibration Isolators								
	Welder Qualifications								

### 3.2 TEST AND REPORT SUBMITTALS:

- A. The following list may be used as a checklist for the Contractor and A/E. All tests may not be listed.
  - 1. Duct air loss test
  - 2. System start-up
  - 3. Fan (air handling) factory vibration test
  - 4. Test and Balance Agency Construction report

### 3.3 CONTROL SUBMITTAL:

- A. Control submittals shall include the following:
  - 1. All information necessary for a clear representative of the system to be provided.
  - 2. All control components.
  - 3. Graphical representative of all systems to be controlled.
  - 4. I/O summary sheets.
  - 5. Floor plan indicating panels.
  - 6. Sequence of operation. All devices referenced in the sequence shall be indicated on graphic representation.
  - 7. Large scale (75% reduction maximum) of all control panel faces.
  - 8. Wiring diagrams including interface with equipment (terminal strip, contactor, etc.).
- B. All drawing submittals shall be CADD generated drawings.
- C. Submit a floor plan locating all thermostats, sensors, lighting override switches, and control panels. Contractor must receive approval in writing before roughing in controls.

### 3.4 SHOP DRAWING SUBMITTAL COVER SHEET:

- A. A separate cover sheet shall be submitted with each product type (i.e., valves can be submitted together, etc.)

3.5 SHOP DRAWING SUBMITTAL COVER SHEET  
(Provide one page for each group of shop drawings.)

PROJECT NAME: HGTC - Horry Georgetown Technical College BGA FILE No. 21105-3-33  
PRODUCT: \_\_\_\_\_ BGA SHOP DWG. No. \_\_\_\_\_

NOTE TO CONTRACTOR

1. All shop drawing comments by Buford Goff & Associates shall be complied with or the shop drawings shall be declared rejected.
2. If this form is not completed and signed by the Contractor and items 1 to 8 below are not answered YES or N/A, the shop drawings shall be declared rejected.
3. Dampers, grilles, valves, etc., are reviewed for characteristics but not for size and quantity. It is the Contractor's responsibility to verify sizes and quantity.

SHOP DRAWING SUBMITTAL (Contractor to complete this section)

1. Does the submittal comply with the contract documents?  Yes  No  
If no, list all deviations on an attached page.
2. Have the electrical characteristics (i.e., volt/phase/amps, MOP, MCA, and connection location) been reviewed with the electrical schedules and the electrical circuit sizing meet the requirements of that equipment?  Yes  No  N/A
3. Is product an approved manufacturer listed in the specifications or addendum?  Yes  No  N/A
4. Does the product submitted meet the manufacturer's recommended service clearance for the space in which it is to be installed?  Yes  No  N/A
5. Have the control components of the product been reviewed and do they meet with the requirements of the controls contractor?  Yes  No  N/A
6. Have the equipment connections been reviewed (size and locations) and has the Contractor included all provisions to make the required connections?  Yes  No  N/A
7. Has the seismic engineer reviewed and approved the method of connecting seismic restraints to equipment?  Yes  No  N/A
8. Is the equipment within the weight limitations specified, if any?  Yes  No  N/A

BGA'S SHOP DRAWING STAMP (Engineer to complete this section)

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Contractor is responsible for specific compliance with the information given in the Contract Documents; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades, and the safe and satisfactory performance of his work.

- Reviewed  Reviewed as Noted  Revise and Resubmit  Revise and Resubmit Items Listed  
 See attached for additional comments  Reject

Comments: \_\_\_\_\_

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

END OF SECTION 230511

## SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of motors where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230514 - Variable Frequency Drives
  2. Section 230515 - Controllers, Starters, and Electrical Work

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment and work furnished and installed shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest edition) of the following:
  - a. National Electric Code (NEC)
  - b. National Electrical Manufacturers Association (NEMA)

##### B. Manufacturer:

1. The following motor manufacturers are acceptable:
  - a. Wagner
  - b. General Electric
  - c. Century
  - d. Baldor

PART 2 - PRODUCTS

2.1 MOTORS:

- A. Each Division 23 installer shall provide electric motors to drive equipment being provided by that installer.
- B. All motors shall be of sufficient size for the duty to be performed and shall not exceed their full rated load when the driven equipment is operating at specified conditions.
- C. Motor shall be capable of accelerating driven equipment to operating speed within the motor manufacturers allowable time period.
- D. All motors one horsepower and larger shall be NEMA Premium efficiency motors and meet or exceed EISA requirements of 2007. Efficiencies shall be based upon NEMA Standards Publication MG 1, Table 12-12. Nominal efficiencies shall be:

1. TEFC

<u>HP</u>	<u>3600 RPM</u>	<u>1800 RPM</u>	<u>1200 RPM</u>
1.0	77.0	85.5	82.5
1.5	84.0	86.5	87.5
2	85.5	86.5	88.5
3	86.5	89.5	89.5
5	88.5	89.5	89.5
7.5	89.5	91.7	91.0
10	90.2	91.7	91.0

2. ODP:

<u>HP</u>	<u>3600 RPM</u>	<u>1800 RPM</u>	<u>1200 RPM</u>
1	77.0	85.5	82.5
1.5	84.0	86.5	86.5
2	85.5	89.5	87.5
3	85.5	89.5	88.5
5	86.5	89.5	89.5
7.5	88.5	91.0	90.2
10	89.5	91.7	91.7
15	90.2	93.0	91.7

- E. All motors shall be 40 degrees C. ambient, NEMA standard, continuous duty and 60 Hz.

- F. All vertically mounted motors shall be provided with thrust bearing.
- G. Each motor horsepower scheduled or specified is the minimum acceptable. If horsepower or KW ratings are increased, contractor shall be responsible for all electrical changes necessary.
- H. Motors that are specified to cycle on and off automatically under control of a device shall be capable of making starts as frequently as the device may demand. Other motors shall be capable of being started four times per hour without damage.
- I. Motors equipped with belt drive shall be furnished with sliding bases and belt guards.
- J. Motors shall have a high quality epoxy finish.

## 2.2 MOTORS (VARIABLE FREQUENCY DRIVES):

- A. The motor manufacturer shall guarantee full nameplate horsepower and speed when operated on the specified variable frequency drive.
- B. Motors shall be designed for continuous duty operation, NEMA design B.
- C. Motor shall be suitable for inverter duty.
- D. Internal motor temperature limiting thermostats.
- E. Stainless steel nameplates with:
  - 1. NEMA efficiency index nominal efficiency (MG1-12.53b)
  - 2. AFBMA bearing numbers
  - 3. Lubrication instructions

## 2.3 MOTORS (INDOOR):

- A. Motors shall be open drip type with capacity start/induction run, and ball or sleeve bearings up to 1/2 horsepower and 120 volts.
- B. Motors shall be open drip induction run and ball bearing or sleeve bearings for 1/2 horsepower and greater and 120 volts.

## 2.4 MOTORS (OUTDOOR):

- A. Motors exposed to ambient conditions, located outside, or where indicated shall be TEFC. Where TEFC type are not suitable or recommended, motor shall be TEAO.
- B. Motors shall be provided with drain holes with street elbow and breather at low point.
- C. TEFC motors to be furnished with Class F insulation.
- D. Motors shall be full voltage starting squirrel cage induction type NEMA design B.

- E. Motors shall have permanently numbered neoprene or silicone insulated stator leads brought out to the conduit box through an insulating gasket of neoprene or equal that holds each lead individually and forms a positive seal between the conduit box and frame. Stator leads shall have a brass or copper terminal of the pressure indented type. Motors having parallel leads must be terminated under a single lug.
- F. Motor above 1 HP shall be furnished with diagonally split, cast iron boxes one size larger than manufacturer's standard size with neoprene gasket and threaded conduit entrance. Conduit boxes shall be arranged for 360 rotation in 90 increments. Provision should be made for motor lead ground connection including lug.
- G. Motors shall have anti-friction ball bearings, oversized, suitable for "in-service" regreasing with "Alemite" fittings and relief drain plugs rated 1-5 psi and extensions for flushing lubricant without motor shut-down or disassembly. Bearing shaft seals shall be designed with shaft slingers to prevent moisture or other foreign matter from entering the bearing cavity.
- H. Final vibration readings of each motor shall not be greater than 0.05 in/sec peak overall.
- I. Rotor shall be cast aluminum with a corrosion resistant coating.
- J. Provide lifting eye bolts (not required below frame 182T).
- K. Provide copper windings.
- L. All bolts, screws, and other hardware shall be treated for resistance to corrosion.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230513



## SECTION 230514 - VARIABLE FREQUENCY DRIVES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation and coordination of installation required for Variable Frequency Drives and Variable Frequency Pump Systems where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230513 - Common Motor Requirements for HVAC Equipment
  2. Section 230515 - Controllers, Starters, and Electrical Work
  3. Section 230900 - Instrumentation and Control for HVAC (General)
  4. Section 230904 - Building Automation System

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment and work furnished and installed shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest edition) of the following:
  - a. National Electric Code (NEC)
  - b. National Electrical Manufacturers Association (NEMA)
  - c. NFPA-70
  - d. IEEE-519
  - e. FCC Part 15 Subpart J
2. The variable speed drives shall be UL 508 listed.

- B. All work done under this division of the specifications shall conform with the applicable requirements on the electrical drawings.
- C. Variable frequency drive manufacturer shall be ISO 9001 certified.
- D. Manufacturers:
  - 1. The following variable frequency drive manufacturers are acceptable:
    - a. Toshiba
    - b. Square D
    - c. Danfoss Graham
    - d. ABB
    - e. Mitsubishi
    - f. Emerson
    - g. Honeywell
    - h. Yaskawa

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. The VFD shall be mounted in a NEMA 1 enclosure (indoor application).
- B. The VFD shall be full horsepower rated at the maximum carrier frequency.
- C. All high voltage components within the enclosure shall be isolated with steel or polycarbonate covers.
- D. Suitable for continuous operation at an ambient temperature of 0°C to 40°C, elevation up to 3300 feet altitude with a relative humidity to 95% non-condensing.
- E. A-C line variable of -10% to +10% voltage and +/-5 Hz frequency.
- F. A-C line distribution system capacity shall not exceed 100,000 Amps symmetrical available fault current.
- G. The VFD shall be UL listed for 100K AIC fault current without external fusing and include an inline reactor or bus choke.
- H. Minimum power factor of .95 at all frequencies.
- I. Minimum efficiency of 95%.

2.2 TECHNOLOGY:

- A. The VFD shall be a fully digital PWM.
- B. All programmable settings shall be held in non-volatile memory and shall not be affected by loss of power.

2.3 FEATURES:

- A. The VFD shall use IGBT transistors for inverting section, and the carrier frequency for the transistors shall be adjustable between 3KHz and 16KHz.
- B. The VFD shall have slip compensation for improving speed regulation.
- C. The VFD shall have DC injection braking that is programmable in terms of magnitude and duration.
- D. The VFD shall provide electronic overload protection for the motor. The electronic overload shall meet all applicable U.L. and NEC regulations regarding motor overload protection.
- E. The VFD shall have the capability to start into a rotating load regardless of motor direction immediately upon the start command.
- F. The VFD shall have two contacts rated for 0-25VAC control circuits that indicate "fault" and indicate "drive on."
- G. The VFD shall have automatic restart. This feature shall also allow the number of faults and the time interval between faults to be programmable.
- H. The VFD shall have at least 2 critical frequency avoidance settings. The bandwidth of the critical frequency shall be programmable.
- I. The VFD shall have at least 7 preset speeds which can be used to force the VFD to a known speed via user contact closure.
- J. The VFD shall have square law V/Hz capability.
- K. The VFD shall have at least two analog inputs with at least 12 bits resolution.
- L. The VFD shall be capable of accepting either a 0-10VDC or 0-20mA (scalable) as analog inputs.
- M. Fifteen (15) milli-sec ride through.
- N. Capacity shall be based on 40 degrees C. Capacity shall be 1.1 times load current for 60 seconds and 2.0 times load current for 3 seconds.

2.4 OPERATORS CONTROL PANELS:

- A. The VFD shall have a serial communications port available for configuration, control, and monitoring. The communications shall be BacNet IP or BacNet MS/TP.

- B. Control display shall show the following:
  - 1. Local/remote status indication
  - 2. Motor direction status indication
  - 3. Motor frequency indication
- C. The control panel shall allow input of:
  - 1. Manual start/stop
  - 2. Minimum and maximum speed
  - 3. Acceleration and deceleration (0.1 to 999.9 seconds)
  - 4. Volts/Hz ratio
  - 5. Torque boost
  - 6. Slip compensation
  - 7. Current limit (50% to 110%)
- D. The controller shall have an internal means of deactivating keypad parameter adjustments to eliminate unauthorized data entry.

2.5 LED DISPLAY:

- A. Frequency output
- B. Voltage output
- C. Current output
- D. Motor RPM
- E. Input kW
- F. Elapsed time
- G. Fault indication

2.6 SAFETY FEATURES:

- A. Motor current exceeding 110% for longer than one minute of controller maximum sine wave current rating.
- B. Output phase-to-phase short circuit condition.
- C. Total ground fault under any operating condition.

- D. High input line voltage.
- E. Low input line voltage. Undervoltage trip at 85%.
- F. External fault.
- G. A three phase 5% impedance Line Reactor or 5% DC bus choke shall be provided to minimize drive harmonics on the A-C line and protect the drive from damaging electrical system transients.

## 2.7 ELECTRICAL:

- A. Main electrical disconnect, padlock capable.
- B. Input line fuses shall provide protection for the input rectification circuit using Class J fuses with interrupting rating of 200,000 AIC. The series interrupting rating of the VFD and fuses shall be a minimum of 22,000 AIC.
- C. In lieu of a fused disconnect, a lockable circuit breaker may be provided.

## 2.8 ACCESSORIES:

- A. Motor protecting output filters shall be required for all existing motor and where non inverter rated motors are permitted as follows:
  - 1. 460 V or greater
  - 2. Cable leads in excess of 50 feet

## PART 3 - EXECUTION

### 3.1 FACTORY TESTING:

- A. Each drive power circuit shall be tested under motor load conditions at a minimum of 40 degrees C for no less than 40 continuous hours.
- B. The output waveform shall be monitored for correct PWM algorithm.
- C. Short circuit testing shall be done to U.L. standards.
- D. The VFD shall be monitored for correct phase current, phase voltages, and motor speed.
- E. Current limit protection shall be verified by simulating a motor overload.
- F. A HYPOT voltage test shall be performed using at least 2500 VDC. Leakage currents during this test must not exceed 100 micro amps.
- G. All default programming shall be provided and tested in the factory.

3.2 FIELD START-UP (GENERAL):

- A. The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services.
- B. The commissioning personnel shall be the same personnel that will provide the warranty service and/or repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents.
- C. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.
- D. Several trips may be required by the commissioning technician especially where the VFD's are controlling direct drive fans.

3.3 FIELD START-UP (DIRECT DRIVE FANS):

- A. The commissioning technician shall work closely with the air handler manufacturer to verify the frequencies that the air handler cannot be operated.
- B. The technician shall lock out all frequencies where the fan is unbalanced.
- C. The VFD shall be set up to allow the fan motor to operate within 5% of the motor rated FLA.

3.4 GROUNDING:

- A. Grounding shall be provided in accordance with the manufacturer's installation guidelines.

END OF SECTION 230514

## SECTION 230515 - CONTROLLERS, STARTERS, AND ELECTRICAL WORK

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controllers and electrical work where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230513 - Common Motor Requirements for HVAC Equipment
  2. Section 230514 - Variable Frequency Drives
  3. Section 230900 - Instrumentation and Control for HVAC (General)
  4. Section 230904 - Building Automation System

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment and work furnished and installed shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest edition) of the following:
  - a. National Electric Code (NEC)
  - b. National Electrical Manufacturers Association (NEMA)
  - c. Standard for Industrial Control Equipment of the Underwriter's Laboratories, Inc.
2. All work done under this division of the specifications shall conform with the applicable requirements on the electrical drawings.

B. Manufacturers:

1. The following magnetic starter manufacturers are acceptable:
  - a. Square D
  - b. GE
  - c. Cutler Hammer
  - d. Westinghouse
  - e. Siemens
2. The following manual disconnect switch manufacturers are acceptable:
  - a. Square D
  - b. GE
  - c. Cutler Hammer
  - d. Westinghouse
  - e. Siemens

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Mechanical equipment other than individually mounted motors, shall be factory pre-wired so that it will only be necessary to bring connections to a single set of terminals.
- B. Mechanical equipment electrical components shall be bonded together and connected to electrical system ground.

2.2 MOTOR CONTROLLERS:

- A. Division 23 installers shall provide motor controls and controllers for all items installed under this division of the specifications except for the following equipment:
  1. Controllers to be installed in motor control centers.
  2. Single speed wall switches for 120 volt and 277 volt fan motors. These are shown on mechanical drawings to indicate location only.
  3. Fractional horsepower fans interlocked with light switches.
- B. Unless indicated otherwise, starters shall be magnetic starters.
- C. Branch-circuit protective devices shall not be permitted to serve as controllers on any motors provided under this division of the specifications.



- D. All motor controllers that are specified to be furnished by the Division 23 installer shall be turned over to the electrical installer for installation by the electrical installer unless otherwise specified.
- E. Division 23 installer shall provide motor controls and controllers packaged and pre-wired with equipment where specified or shown on drawings and schedules.
- F. Controllers for variable speed motors shall be installed by Division 23 installer and wired by the electrical installer.
- G. Each controller shall be capable of starting and stopping the motor it controls and shall be capable of interrupting the locked-rotor current of the motor.
- H. Each controller shall have a horsepower rating not lower than the horsepower rating of the motor it controls.
- I. All motor controllers shall be furnished with an identification label designating service for which controller is used. Plate shall be firmly attached to controller or wall mounted adjacent to controller.
- J. All indoor controller enclosures shall be NEMA Type 1 unless specified otherwise. All controller enclosures directly exposed to weather shall be NEMA Type 3R.

### 2.3 MAGNETIC STARTERS:

- A. Unless otherwise indicated on the drawings, magnetic motor starters shall be full voltage and horsepower rated, across-the-line with 120 volt, 60 Hz control for motors up to and including 25 horsepower. Magnetic starters for motors above 25 horsepower shall be reduced voltage type and shall conform to all requirements of the supplying utility company. Each magnetic starter shall be provided with "Run" pilot light and "Stop" pilot light and a fused control voltage transformer.
- B. Pilot lights shall be provided with factory furnished legend plates indicating "Stop", "Run", etc. Pilot lights shall be provided with interlocks controlled by the starter operating coil.
- C. Thermal overloads shall be externally resettable. A thermal overload shall be provided in each phase. Thermal overloads shall be sized in accordance with the actual nameplate current of the motor served.
- D. Each magnetic starter shall be provided with "Start" and "Stop " push buttons, and under voltage protection for manual or automatic operation.
- E. Where required for automatic operation by a remote pilot device under the applicable sections of this Specification, magnetic starters shall be provided with a "Hand-Off-Automatic" selector switch.
- F. Hand-Off-Automatic device shall not be wired to override safety device interlocks on starter. If selector is mounted remotely, provide test start push button on starter.

- G. Each magnetic starter shall be provided with auxiliary contacts (N.O., N.C., or N.O.-N.C.) for interlocking and automatic operation required under the applicable sections of this Specification.
- H. Except where indicated on the drawings, all pilot lights, push buttons, and selector switches shall be mounted in the motor starter cover.
- I. Magnetic starters shall be:
  - 1. Square D Class 8536

#### 2.4 MANUAL DISCONNECT SWITCHES:

- A. Division 23 installer shall provide manual disconnect switches on all 120 volt and 208 volt fan motors.
- B. Disconnect switches shall be line voltage type with overload protection. Disconnect switches shall be quick make and break, toggle operated, trip free, and shall be provided with a lockoff handle guard and oversized enclosure.
- C. Where required for automatic operation by a remote pilot device under the controls section of this specification, disconnect switches shall be provided with a "hand-off-automatic" selector switch in addition to the "on-reset-off" toggle switch.
- D. All indoor disconnect switch enclosures shall be NEMA Type 1 unless specified otherwise. All disconnect enclosures directly exposed to weather shall be NEMA Type 3R unless specified otherwise.
- E. Disconnect switches for fractional horsepower motors shall be:
  - 1. Square D Class 2510 Type F

#### 2.5 ELECTRICAL DEVICES:

- A. All devices which make and/or break electrical circuits shall be rated for at least 125 percent of load. Where contactors are used for heating, they shall be rated for 150 percent of load.
- B. Relays, contactors, and control devices shall open all ungrounded conductors.

#### 2.6 FUSES:

- A. All fuses shall be on-time, non-renewable type, with plug fuses limited to less than 125 volts.

### PART 3 - EXECUTION

#### 3.1 FUSES:

- A. Provide fuses for all equipment furnished by the Division 23 installer.

END OF SECTION 230515

## SECTION 230517 - SLEEVES, SEALS, AND ESCUTCHEONS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of sleeves, seals, and escutcheons where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.
- B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:
  1. Section 232113 – HVAC Piping (General)

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturers:

1. The following mechanical seal and sleeve manufacturers are acceptable:
  - a. Thunderline Corporation
  - b. Metraflex
  - c. Approved equal

### PART 2 - PRODUCTS

#### 2.1 SLEEVES:

##### A. General:

1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs unless specific details indicate otherwise.

B. Type:

1. Sleeves in non-masonry or concrete construction shall be minimum 24 gauge sheet metal.
2. Sleeves in masonry or concrete construction shall be schedule 40 black or galvanized steel.
3. Sleeves in membrane or waterproof construction shall have flashing ring or other method acceptable to the membrane or waterproofing manufacturer.
4. Sleeves provided at floor slabs and support piping weight shall be cast in place and have a minimum of four anchoring tabs.
5. Split sleeves shall be permitted only when approved by the Engineer.

C. Sleeve Sizes:

1. Sleeves for uninsulated piping shall be two pipe sizes larger than pipe passing through or a minimum of 1/2" clearance between inside of sleeve and outside of pipe.
2. Sleeves for insulated piping shall be adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
3. Sleeves for branches off of risers shall be sized as required for insulated or uninsulated pipe and shall also be sized to accommodate expansion of riser.

D. Sleeve Length:

1. Sleeves shall be equal to thickness of construction and terminated flush with surfaces.

E. Sleeve Packing:

1. Sleeves shall be packed as follows:
  - a. As indicated on detail or firestopping specification.
  - b. If not indicated otherwise, seal entire sleeve at exterior wall with silicone caulk.

F. Fire Rated Assemblies:

1. Provide sleeve where required by UL firestop assembly utilized.
2. Do not provide sleeve where not permitted by UL firestop assembly utilized.
3. Sleeve size, length and type shall be equal to that required for the UL firestop assembly utilized.

2.2 ESCUTCHEONS:

A. General:

1. Escutcheons shall be chrome plated brass.
2. Escutcheons shall be held in place by internal spring tension or set screws.
3. Escutcheon plates shall be large enough to completely close hole around pipes and sleeve and shall be square, octagonal or round.

B. Escutcheons shall be located:

1. On all exposed piping through walls, floors, partitions and ceilings except in unoccupied equipment rooms (i.e. boiler rooms and similar spaces).

PART 3 - EXECUTION

3.1 GENERAL:

A. Installation:

1. Install sleeve at time of construction of assembly.
2. Pipe shall be centered to the extent practical in the sleeve. Where proper firestopping or insulation cannot be installed, sleeve shall be reset.

END OF SECTION 230517

## SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of supports and anchors on all piping and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230548 – Sound, Vibration, and Seismic Control for HVAC
  2. Section 230719 - HVAC Piping Insulation
  3. Section 232113 - HVAC Piping (General)

#### 1.3 QUALITY ASSURANCE:

- A. Products not otherwise specified in these documents shall be furnished by the listed manufacturers and installed in accordance with the manufacturers recommendation.
- B. Products used shall be consistent with industry practice for use in commercial or industrial installation.
- C. Codes and Standards:
  1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
    - a. ANSI B31.3 - Pressure Piping
    - b. Factory Mutual
    - c. International Building Codes
    - d. Manufacturer's Standardization Society Documents, MSS-SP-58, MSS-SP-69
    - e. Pipe Fabrication Institute, Standard ES-26

- f. AISC Specification for the Design, Fabrication, and Erection of Structural Steel Buildings

D. Manufacturers:

1. The following pipe hanger and support manufacturers are acceptable:
  - a. B-Line
  - b. Pipe Hangers and Devices Mfg. Inc.
  - c. Anvil International
2. The following refrigerant pipe clamp manufacturers are acceptable:
  - a. IRP
  - b. Hydro-Zorb
  - c. Armafix
3. The following channel support manufacturers are acceptable:
  - a. Erico Eritrust
  - b. Unistrut
  - c. Approved Equal

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. It shall be the Contractor's responsibility to provide an adequate pipe support system in accordance with recognized engineering practices using, where possible, standard, commercially available hangers, support, guides, anchors and accessories.
- B. Model numbers are indicated for products not exposed to ambient conditions. The products exposed to ambient conditions shall be a similar product but with the material or finish specified for products exposed to ambient conditions.
- C. Materials shall be selected to prevent electrolysis and minimize corrosion for the environment in which the product is to be installed.
- D. Hanger shall be sized for insulation to run through hanger.

### 2.2 SAFETY FACTOR:

- A. All attachments, rods, and accessories selected based on weight load shall be selected for a two times safety factor minimum.

2.3 SEISMIC RESTRAINTS:

- A. Where seismic restraints of components is required, attachments shall be per the requirements of the Vibration and Seismic Controls specifications.

2.4 PRODUCTS EXPOSED TO AMBIENT CONDITIONS:

A. Materials:

- 1. The material for all accessories including, but not limited to, rods, bolts, fasteners, inserts, saddles, supports, anchors, clamps, auxiliary steel, and accessories shall be stainless steel or hot dipped galvanized unless specifically noted otherwise.

B. Hangers:

- 1. Swivel loop hangers shall be zinc electroplate finish.

C. Shields:

- 1. Shields shall be stainless steel.

2.5 PIPE HANGERS, SUPPORTS, AND ACCESSORIES - GENERAL (INDOOR):

A. General:

- 1. Other finishes may be specified for specific applications.

B. Hangers:

- 1. Swivel loop hangers for insulated pipe shall be carbon steel with zinc electroplate finish.

C. Shields:

- 1. Shields shall be carbon steel with zinc electroplate finish.

2.6 PIPE HANGERS - INSULATED PIPING (OTHER THAN HEATING PIPING):

A. Pipe up to 2" - Swivel loop hanger with shield:

- 1. Anvil Model No. 69 with 167 shield
- 2. At contractor's option, clevis hanger may be used.

B. Pipe 2½" and larger - Clevis hanger with shield:

- 1. Anvil Model No. 260 with 167 shield



2.7 PIPE HANGER SPACING:

A. General:

1. The maximum spacing for pipe hangers and supports shall not exceed those stated in these specifications or the hanger manufacturer's recommendations, which is less.
2. Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components.
3. Hangers shall be provided within 12" of each change of direction, at each valve, and at equipment connections.
4. Pipe not listed shall meet the spacing requirements of the manufacturer.

B. Copper Pipe and Tubing:

<u>Size</u>	<u>Max. Span Ft.</u>
Less than 1-1/2"	5
1-1/2" and greater	8

2.8 HANGER RODS:

- A. Threaded rods, if not indicated otherwise, shall be carbon steel with zinc electroplate finish.
- B. Where seismic restraints of components are required, rod sizes shall be per the requirements of the Mechanical Sound, Vibration, and Controls specifications.
- C. Rod capacity based upon ASTM A107 at 650 degrees F is as follows:

<u>Rod Dia.</u>	<u>Max. Load</u>	<u>Max. Load (@ 2 x SF)</u>
3/8	610	305
1/2	1130	565
5/8	1810	905

2.9 MISCELLANEOUS STRUCTURES:

A. Metal Roofing Systems:

1. Provide steel angle stiffeners and supplemental steel as required by the metal roofing system manufacturer to attach hangers and supports to purlins.
2. Provide steel angles or channels to support hangers located between purlins.

2.10 AUXILIARY SUPPORTS, FASTENERS, AND ACCESSORIES:

- A. Provide all auxiliary supports, anchors, and fasteners necessary for the installation of piping, equipment, and accessories.
- B. Supports shall include angles, channels, flat steel, rods, bolts and appurtenances.
- C. Special supports shall be provided where standard hanger, supports, or attachments cannot be used. This includes, but is not limited to, use of trapeze supports, suspending supports from other supports (where acceptable to manufacturers, etc.).

2.11 SWAY BRACING:

- A. Sway bracing shall be located and constructed for pipe subject to horizontal movement unless movement is specifically designed to meet seismic requirements.

2.12 CHANNEL SUPPORTS:

- A. General:
  - 1. Channel supports shall be utilized wherever practical and whenever a channel support provides a cleaner installation than individual attachments to the structure.
- B. Construction:
  - 1. Channel supports shall be 12 gauge minimum and dimensions as necessary to meet project conditions.
  - 2. Channels in conditioned spaces or in plenums above conditioned spaces shall be pregalvanized or powder coated carbon steel.
  - 3. Channels exposed to ambient conditions shall be hot dipped galvanized after fabrication, aluminum, stainless steel, PVC coated, or epoxy coated.
  - 4. Channels shall have holes, slots, knockouts, etc. as required by the Contractor.
- C. Clamps and Accessories:
  - 1. Clamps, accessories, fasteners, etc. shall generally be the same materials as the channel supports unless indicated otherwise.
  - 2. Pipe clamps for indoor pipe shall have a pipe cushion.
  - 3. See refrigerant pipe clamps for refrigerant pipe.

2.13 BEAM CLAMPS:

- A. Clamps shall be designed to attach hanger rods to a beam or bar joist.
- B. Clamps shall be provided with locknut.

2.14 REFRIGERANT PIPE CLAMPS:

- A. General:
  - 1. Horizontal refrigerant pipe may be supported by either of the following methods:
    - a. Provide a pipe insert at the point of support. See pipe insulation.
    - b. Provide refrigerant pipe clamp specified in this section.
- B. Pipe Clamp:
  - 1. Metal pipe clamp shall have an inner rubber cushioning.
  - 2. Clamp shall be sized to allow refrigerant pipe with insulation to pass through the inner rubber cushioning.
- C. Basis of design manufacturer shall be:
  - 1. IRP Hydra-Zorb Klo-Shure Cushion Clamp

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide all steel and concrete required for support and anchoring of pipes other than shown on architectural drawings.
- B. Contractor shall bear all responsibility for materials and workmanship as described in this section, and shall make sure that all hangers and supports are properly and permanently connected to building structure.
- C. All pipe supports shall be designed to avoid interferences with other piping, hangers, electrical conduits and supports, building structures and equipment.
- D. Guide points for expansion joints shall be located and constructed wherever required or shown on drawings and at each side of an expansion joint or loop, to permit only free axial movement in piping systems. Guides shall be securely anchored to structure.
- E. Provide hanger rod nuts on both sides of clevis and trapeze hangers.

3.2 SUBMITTAL:

- A. Manufacturer shall be responsible for reviewing all plans, specifications, and existing conditions to determine the types, quantities, and accessories required to provide a complete system of pipe support.
- B. Submit shop drawings for each product to be used and indicate where the product is to be installed (i.e., steam piping in tunnel, chilled water pipe in crawl space, etc.).

3.3 AUXILIARY SUPPORTS, ANCHORS, AND FASTENERS:

- A. Supports attaching to steel structure shall be by bolting or clamping without penetrating structural member. Welding is not permitted without written permission.
- B. All fasteners shall be provided which resist loosening from vibration.

END OF SECTION 230529

SECTION 230548 – SOUND, VIBRATION, AND SEISMIC CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical sound, vibration, and seismic control required on all mechanical equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

- B. All foundations and supports of Division 23 equipment shall be furnished and installed by Division 23 installer except where specifically noted otherwise.

1.2 RELATED DOCUMENTS:

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

- B. All sections of Division 23 Specifications apply to this section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. All seismic equipment and design shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

- a. International Building Codes
- b. SMACNA Seismic Restraint Manual
- c. ASHRAE
- d. ASTM E 488 (Anchor locations)

- B. Mechanical sound, vibration and seismic control equipment shall be sized and provided by manufacturer only. Seismic bracing shall be a factory manufactured item listed in the manufacturers catalog for the intended use.

C. Manufacturer:

1. The following sound, vibration, and seismic control (except flexible pipe connectors) manufacturers are acceptable:

- a. Mason Industries

- b. Korfund Dynamics Company
- c. Vibration Mountings and Controls, Inc.
- d. Peabody
- e. Amber Booth
- f. Vibration Eliminator, Inc.
- g. Vibro-Acoustics Corporation

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. All equipment and piping shall be mounted on or suspended from approved foundations and supports as specified herein and as shown on the drawings.
- B. The vibration isolation systems shall be guaranteed to have the deflection recommended by the manufacturer for the specific application but no less than shown on the schedule. Mounting sizes shall be determined by the mounting manufacturer and mountings shall be installed in accordance with the manufacturer's instructions.
- C. The installed vibration isolation system for floor or ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shut down conditions of 1/4 inch. Motions in excess of this amount shall be restrained by approved spring type mountings.
- D. Components not exposed to ambient:
  - 1. Steel components shall be powder coated. All nuts, bolts, and washers shall be zinc-electroplated. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.
- E. Components exposed to ambient or inside air handlers:
  - 1. All components shall be PVC coated steel, hot-dip galvanized, stainless steel, or heresite coated.

### 2.2 VIBRATION ISOLATORS:

- A. General:
  - 1. Where steel spring isolation systems are required, the mounting assemblies shall:
    - a. Utilize bare springs with the spring diameter not less than 0.8 of the compressed height of the spring at rated load.
    - b. Springs shall have minimum additional travel to solid equal to 50 percent of rated deflection.

2. Each spring isolator shall be designed and installed so that the ends of the spring remain parallel during and after the specified minimum deflection to solid height.
  3. All spring-flex mountings shall be completely stable beyond rated load and have an additional 30% capacity (minimum), and horizontal and vertical spring constants shall be equal ( $k_x/k_y=1$ ).
  4. Vibration isolation equipment submittal drawings shall include the following information:
    - a. Isolation mounting deflections.
    - b. Spring diameters, compressed spring heights at rated load; solid spring heights, where spring isolation mountings are used.
    - c. Equipment operating speed.
    - d. Clearly outlined procedures for installing and adjusting isolators.
  5. Isolators for equipment installed outdoors shall be designed to provide adequate restraint due to normal wind conditions and to withstand design wind loads or 30#/sq. ft., whichever is greater, applied to any exposed surface of the isolated equipment.
  6. Neoprene shall be bridge bearing type.
  7. Mounts shall have holes in baseplate for anchoring to structure.
  8. All baseplates shall be sized to meet manufacturer's maximum published seismic restraint rating.
- B. Specification type "B" (Seismic Mounts):
1. Freestanding spring type isolators with ductile iron housing. Isolators shall include leveling bolts which shall be rigidly bolted to equipment. Mounting shall be designed to resist seismic forces in all directions.
  2. Basis of design manufacturer shall be:
    - a. Mason Industries type SSLFH.
- C. Specification type "D" (Hangers):
1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30 degree arc before contacting the hole and short circuiting the spring.
  2. Basis of design manufacturer shall be:
    - a. Mason Industries, Inc. type 30N.

D. Specification type "E" (Precompressed Hangers):

1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. They shall be precompressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. Deflection shall be clearly indicated by means of a scale. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30 degree arc before contacting the hole and short circuiting the spring.
2. Basis of design manufacturer shall be:
  - a. Mason Industries, Inc. type PC30N.

E. Specification type "F" (Duct Hangers):

1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30 degree arc before contacting the hole and short circuiting the spring. Hangers shall be provided with an eye bolt on the top and bottom.
2. Basis of design manufacturer shall be:
  - a. Mason Industries, Inc. type W30N.

F. Specification type "G" (Bases):

1. Structural steel bases shall be rectangular in shape for all equipment. All perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of one inch.
2. Basis of design manufacturer shall be:
  - a. Mason Industries, Inc. type WF.

G. Specification type "X" (Thrust Restraints):

1. Horizontal thrust restraints shall consist of a spring element in series with a neoprene pad as described in Specification type "B" with the same deflection as specified for the mountings or hangers. The spring element shall be contained within a steel frame and designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" movement at start and stop. The assembly shall be furnished with one rod and angle brackets for attachment to both the equipment and ductwork or the equipment and the structure.



Horizontal restraints shall be attached at the centerline of thrust and symmetrically on either side of the unit.

2. Basis of design manufacturer shall be:
  - a. Mason Industries, Inc. type WB.

### 2.3 VIBRATION ISOLATOR SCHEDULE:

- A. General:
  1. Deflection shown is a minimum value. Higher values may be required by seismic design.
- B. Suspended Air Handling Equipment:
  1. Type E hanger, deflection 1.25"
- C. Suspended Fans:
  1. Type E hanger, deflection 2.0"
  2. Type X thrust restraint
- D. Fans mounted in Air Handlers:
  1. Type B mount, deflections 2.0"
  2. Type G base (less than 4" TSP)
  3. Type X thrust restraint
- E. Engine Exhaust:
  1. Type E hanger, deflection .5"

### 2.4 SEISMIC DESIGN:

- A. General:
  1. Specifications and plans shall indicate minimum requirements and general intent. The actual requirements shall be determined by the contractor's seismic system engineer but those requirements shall not be less than indicated on the plans and in these specifications.
  2. The seismic engineer shall be a professional engineer registered in the state in which the facility is to be constructed and whose principal area of practice is in seismic engineering and related fields. The engineer shall be in the full time employment of the company submitting the product. The seismic engineer shall be responsible for:
    - a. Submittals (drawings and calculations)

- b. Seismic Quality Assurance Plan
      - c. Certificates of Compliance
    3. Where pipes, ducts, conduit, and similar systems cross the seismic isolation interface between two seismically isolated structures, the pipes, ducts, conduit, and similar systems shall have flexible connections to accommodate the seismic displacement of the structures. Typically, this will include flexible connections on one side of the interface.
    4. The following mechanical components, except ceiling mounted mechanical components, shall be exempt from seismic design:
      - a. All components in seismic design category A and B.
      - b. All components in seismic design category C where  $I_p = 1.0$ .
      - c. All components in seismic design category D, E, or F:
        - 1) 20# or less
        - 2) For distribution systems 5#/LF or less
        - 3) Flexible connections between component and duct, piping, and conduit
        - 4) Components mounted 4 ft. or less above floor weighing 400# or less, and  $I_p = 1.0$
- B. Duct Systems:
  1. Seismic restraints are required for all ducts unless specifically indicated otherwise.
  2. The following duct shall be exempt from seismic design:
    - a. Duct with an  $I_p = 1.0$  and with a cross-sectional area of less than 6.0 SF.
    - b. Duct with an  $I_p = 1.0$  and installed 12 inches or less from the point of connection to the supporting structure above to top of duct (excluding insulation or any other coverings) for full length of duct run (duct run is up to change of direction of more than 2 times duct width in degrees).
- C. Components in Duct Systems:
  1. Components and equipment installed in the duct system having flexible duct connections at one or more ends and weighing 20 pounds or less may be considered part of the duct system.
  2. Components and equipment installed in the duct system having no flexible duct connection and weighing 75 pounds or less may be considered part of the duct system.

3. Connections to components and equipment in the duct system (i.e., hydronic or steam coils, electrical conduit, central conduit, etc.) shall accommodate differential movement utilizing type of flexible connection indicated on drawings or elsewhere in the specifications. If none indicated, flexible connection may be:
  - a. Flexible connector
  - b. Swing joints
  - c. Multiple elbows
4. All components and equipment greater than 20 pounds with flexible duct connectors or greater than 75 pounds shall be independently supported and seismically restrained independently of the duct system.

D. Piping Systems:

1. Seismic restraints are required for all pipes unless specifically indicated otherwise.
2. Seismic restraints are not required for the following pipe provided the pipe is installed where it is protected from impact or will avoid the impact of larger pipe or equipment:
  - a. Pipes are supported by clevis or roller hangers and installed 12 inches or less from the point of connection to the supporting structure above to the top of the pipe (excluding insulation or any other coverings).
  - b. Pipes are supported by trapeze or roller support and are installed 12 inches or less from the point of the supporting structure above to the top of the trapeze or part of the roller support supporting the pipe.
  - c. High deformity piping in Seismic Design Category D, E, or F,  $I_p = 1.5$ , and nominal pipe size 1 inch or less. Total weight, if on a trapeze, must be 10# or less.
  - d. High deformity piping in Seismic Design Category C,  $I_p = 1.5$ , and a nominal pipe size of 2 inches or less.
  - e. High deformity piping in Seismic Design Category D, E, or F,  $I_p$  equal to 1.0, and nominal pipe size 3 inches or less.
3. Other piping systems shall meet or exceed the requirements of the IBC and the listed standard (whichever is greater):
  - a. Natural Gas - ASME B31.4

E. Importance Factor ( $I_p$ ):

1. Components containing hazardous or flammable material shall have an importance factor of  $I_p = 1.5$  and shall include, but not be limited to:
  - a. Gas systems
2. Importance factor for all mechanical components in Seismic Use Group IV shall be  $I_p = 1.5$ .
3. Importance factor for the following equipment shall be  $I_p = 1.5$ :
  - a. Equipment with gas furnaces
4. Importance factor for other mechanical components shall be  $I_p = 1.0$  unless indicated otherwise.

2.5 WIND LOAD DESIGN:

A. General:

1. Specifications and plans shall indicate minimum requirements and general intent. The actual requirements shall be determined by the contractor's structural engineer but those requirements shall not be less than indicated on the plans and in these specifications.
  2. The structural engineer shall be a professional engineer registered in the state in which the facility is to be constructed. The structural engineer shall be responsible for:
    - a. Submittals (drawings and calculations)
  3. All equipment located outdoors shall be designed to meet or exceed the requirements of the current IBC wind load requirements.
  4. Calculations shall be based on the ASCE determined design pressure, exposure class, building height, and building type.
- B. All outdoor equipment located on equipment pads shall be anchored to the equipment pads to withstand the IBC wind load requirements. Equipment pads shall be designed to withstand these requirements.
- C. Where additional bracing or tie downs are required, they shall be provided at no additional cost to the Owner.
- D. Coordinate the restraints required for wind loading with the seismic and vibration requirements indicated on the drawings and specifications.

## 2.6 ANCHORAGE TO BUILDING STRUCTURE:

### A. General:

1. Anchorage to the building structure shall meet the latest requirements of:
  - a. International Building Code (Chapter 19)
  - b. ASCE Standard 7-05 (Chapter 13)
  - c. American Concrete Institute (ACI) 318
2. Requirements of this section of specifications are minimum requirements. When other requirements are indicated, the greater requirement shall be met or exceeded.

### B. Anchorage in Concrete or Masonry:

1. Calculation of anchorage forces shall be provided by the seismic engineer for all installations in Seismic Design Category C, D, E, and F.
2. The following anchorage and attachments are not permitted:
  - a. Power driven fasteners for tension load applications in Category D, E, and F unless specifically approved for this application.
  - b. Friction clips.

### C. Post Installed Anchors:

1. Post installed anchors for Seismic Design Category C, D, E, and F shall meet the requirements of ACI 318.

### D. Threaded Rod Supports:

1. Rod supports shall be designed to resist bending moments.
2. Threaded rod supporting duct, piping, equipment, or other components shall connect to structure by use of a swivel, eyebolt, vibration isolation hanger or other connection

## 2.7 VIBRATION AND SEISMIC ACCESSORIES:

- A. Provide all necessary brackets, bolts, fasteners, predrilled bases, oversized bases, accessory components and materials to install systems in accordance with manufacturer's requirements.

2.8 OUTDOOR EQUIPMENT:

- A. Slab Mounted Equipment (outdoor):
  - 1. Equipment shall be direct anchored if design permits unless isolation bases are required.
  - 2. If no other isolation is indicated for outdoor equipment (not including cooling towers), 3/4" neoprene waffle pads shall be provided.

PART 3 - EXECUTION

3.1 GENERAL:

- A. If the equipment to be mounted or restrained is not furnished with integral structural frames and external mounting lugs (both of suitable strength and rigidity), approved members shall be installed in the field which shall provide means of attaching required vibration and seismic devices.
- B. The members include, but not limited to the following: gussets, rails, brackets, angles, channels and similar components. These members should be sized by the vibration and seismic vendor to provide an acceptable installation.
- C. All field installed components shall be neatly installed and be of materials and/or finish suitable for the installation.

3.2 SUBMITTALS (VIBRATION ISOLATION):

- A. The manufacturer shall submit drawings indicating location and type of all vibration isolation components provided.
- B. A schedule shall show capacity and load of each component at each location.
- C. Design shall be based upon actual installation and not contract drawing schematics.

3.3 SUBMITTALS (SEISMIC LOAD):

- A. Seismic Restraints:
  - 1. Submit drawings showing seismic loading, location of bracing, and types and sizes of bracing assemblies. The level of detail and information provided shall be similar to those included in the "SMACNA Seismic Restraint Manual."
  - 2. Submit seismic protection ratings in three principle axes certified by an independent laboratory.
  - 3. Submit calculations for shear, pull-up, primary overturning, and secondary overturning.
  - 4. Submit drawings indicating auxiliary supports and method of attachment.

5. Submit drawings indicating size and type of attachment (i.e., welding, bolting, etc.) to:
  - a. Equipment supports to building structure.
  - b. Attachment of equipment to equipment supports.
  - c. Attachment of equipment to housekeeping pads or slab.
6. Submittals for seismic snubbers shall also include detailed drawings of steel sole plates and all anchorage to building structure including welding, bolting, and other methods of attachment. Submittal shall clearly indicate location of attachment and structural members.

B. Attachments and Connections:

1. Submit drawing indicating type of connection (i.e., clamp, eye bolt, swivel, etc.) to:
  - a. Beams
  - b. Joists
  - c. Structure members
2. Submit drawings indicating type of attachment (welding, bolting, etc.) to:
  - a. Structural members
  - b. Components or equipment

- C. Calculations shall be submitted and signed by a licensed professional engineer in the state where the project is located.

3.4 SUBMITTALS (WIND LOAD):

- A. Submit drawings and calculations showing wind loading, location of anchors, ties and bracing, and types and sizes of restraints.
- B. Submit drawings showing auxiliary supports and method of attachment.
- C. Submit drawings and calculations showing the attachment of equipment to curbs and structure.
- D. Submit drawings and calculations showing the attachment of curbs to the roofing members.

3.5 SUPERVISION:

- A. The manufacturer, or his qualified representative, shall be responsible for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation,

the manufacturer, or his representative, shall make a final inspection and submit his report to the A/E in writing certifying the correctness of installation and compliance with approved submittal data.

3.6 INSTALLATION:

- A. Where field conditions, construction schedule, or construction progress require that isolators be installed after the equipment or systems are installed, provide temporary supports until that time when isolators can properly be installed.

END OF SECTION 230548



## SECTION 230592 - SYSTEM START-UP

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the start-up of all building mechanical systems where shown on the drawings and specified hereinafter.

##### B. Description:

1. These systems shall include:
  - a. Air systems (heating, ventilating, air conditioning, exhaust and recirculation)

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230593 - Testing, Adjusting, and Balancing for HVAC

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and standards:

1. All work shall meet or exceed the standards and procedures of the following (latest edition):
  - a. AABC National Standards
  - b. SMACNA

##### B. Start-up of equipment shall be by manufacturer's representative unless noted otherwise.

##### C. Tests, in addition to those specified herein, required to prove code compliance, to meet insurance requirements, and to verify proper installation by the A/E, owner, or authorities having jurisdiction shall be provided by the Contractor.

##### D. All tests, instruments, and procedures shall be in accordance with the AABC National Standards and system test and balance specifications.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. All concealed work must remain uncovered until required tests have been completed. Sections of the system may be tested prior to concealing as outlined hereinafter.
- B. The Owner and the A/E shall be notified in writing a minimum of three working days prior to any tests being performed.
- C. Local, state and federal authorities having jurisdiction shall be notified in writing with sufficient time to schedule inspection as required by the authority.
- D. In no case shall a system be started or operated in such a manner that the system or component pressure or temperature ratings, or the pressure or temperature to which a system or component has been tested, be exceeded.

### 2.2 START-UP:

- A. Systems shall be started up by the Contractor except as required in specific portions of the mechanical specifications.
- B. The following systems shall be started up by a factory certified technician:
  - 1. Packaged heating and air conditioning equipment
  - 2. Large fans
  - 3. Vibration isolation
  - 4. Vehicle exhaust fan system
  - 5. Air handlers
  - 6. Ductless split system
- C. The following systems shall be started up by a factory technician:
  - 1. 100% Outside air equipment – factory technician

### 2.3 AIR DISTRIBUTION SYSTEMS:

- A. General:
  - 1. Cleaning and leakage testing are not required for existing duct systems unless indicated otherwise.
- B. Cleaning of Duct System:
  - 1. Upon completion of duct and before installation of any outlets, the contractor shall clean entire duct system of all rubbish, plaster, dirt, etc.

- C. Leakage Tests for systems 2 inch w.g. and less:
1. Verify, by use of air monitoring devices and pitot tube traverse, that the total air quantities measured at all outlets and the air quantity handled by the fan differ by no more than  $\pm 5\%$ .
  2. Where leakage is determined to exceed 5% in accordance with the above testing procedure, the Contractor shall locate and repair the duct to reduce the leakage to acceptable levels.
  3. Where excessive leakage is noted at any location, whether the entire system meets the 5% leakage rate or not, the Contractor shall repair the duct to minimize the leakage at the location identified.
  4. Leakage includes all connected components of the system.
  5. Leakage tests shall be repeated until the duct is proven to be within the limits of leakage specified herein.

#### 2.4 STARTING THE PIPING SYSTEMS:

- A. Prior to putting any piping system in service, it shall be tested and thoroughly cleaned according to the procedures as specified below and as required by the equipment manufacturer, whichever requirement is more stringent.
- B. The Contractors are responsible to take all precautions necessary to prevent contamination of existing domestic water and also to prevent unauthorized use, when connecting new systems to existing water lines.
- C. Dehydration of Refrigerant Piping Systems:
1. Dehydrate refrigerant piping systems using a vacuum pump with check valve.
  2. The systems shall be evacuated to 500 microns and held there for three hours.
  3. The vacuum shall be broken with dry refrigerant.
  4. After approved by the third party inspector, fill the system with its operating charge of refrigerant.
  5. Variable refrigerant systems shall be tested in accordance with manufacturer's requirements. System shall be evacuated to the level indicated in this specification or what is required by the manufacturer, whichever is most stringent.

#### 2.5 PIPING SYSTEM TESTS:

- A. General:
1. Upon completion of each system of work under this Division and at a designated time, all piping shall be pressure tested for leaks.

2. All piping located underground shall be tested before backfilling.
3. Sections of the system shall be tested prior to concealing the piping in walls, chases, false ceilings, etc.
4. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to Owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted.
5. All equipment not capable of withstanding the test pressure shall be valved off during test.
6. Provide all gauges, valves, caps and accessories to properly test system.
7. At no time shall a system be tested at a pressure greater than the piping system or component is rated.

B. Refrigerant Piping:

1. Refrigerant piping shall be tested in accordance with the equipment manufacturer's recommended pressure.
2. All joints and equipment shall be leak tested using a halide or electronic leak detector.
3. The test shall be for the length of time recommended by the manufacturer or thirty minutes, whichever is greater, without leakage.

C. Gas Piping:

1. Gas piping shall be tested in accordance with these specification, the current edition of the International Fuel Gas Code (IFGC), or the local authority have jurisdiction, whichever is greater. If the contractor does not have a copy of the section of the International Fuel Gas Code, Buford Goff & Associates will provide a copy upon request.
2. Piping shall be tested to 1 ½ times working pressure but not less than 5 PSIG.
3. Testing shall be performed before painting. If the piping is painted before testing, test pressure shall be 1 ½ times working pressure but not less than 90 PSIG.
4. Tests shall run for ½ hour for each 500 cu ft of pipe volume.
5. Pressure shall be measured with a manometer.
6. The test gas shall be air, nitrogen, carbon dioxide or an inert gas.
7. Connection between new and existing pipe shall be tested by an approved leak detection method.

8. Isolate appliances or plug lines as required by the IFGC.

D. Piping Systems with Mechanical Connections:

1. Piping shall be tested in accordance with manufacturer's requirements.

2.6 SYSTEM START-UP:

A. General:

1. System shall be started and checked to ensure safe and proper operation.
2. Minimum requirements are listed for each system and are in addition to manufacturer start-up requirements and the requirements stated in the specific sections of the specifications.
3. Temperature control systems installed complete and operable.
4. Proper thermal overload protection in place for electrical equipment.

B. Air Systems:

1. Verify proper fan rotation.
2. Verify full load amps are below nameplate amps.
3. Verify control dampers operating.
4. Verify balance dampers are open.
5. Remove all duct restrictions.
6. Verify clean filters are installed.
7. Verify access doors are closed and duct end caps are in place.
8. All outlets shall be installed and connected.

C. Vibration Isolation System:

1. Verify that all systems are free floating. Check for short circuits.
2. Check that hanger rods are not hitting hanger.
3. Determine if isolators are properly adjusted.
4. Check all bearings with stethoscope for excessive bearing noise.
5. Check alignment of flexible connections.
6. Check free length of duct connectors.

2.7 SYSTEM PRESSURES:

- A. Observe the start-up of systems to verify that no dangerous conditions exist as the result of high (supply) or low (return/exhaust) pressure. If excessive pressures are observed, report the observed condition and shut down or modify system operation to avoid damage.

PART 3- EXECUTION

3.1 SUBMITTALS:

- A. Submit to the A/E all test results including a minimum of the following information:
  - 1. System tested
  - 2. Location of test
  - 3. Date, time, and ambient temperature at test startup and completion
  - 4. Persons present for test
  - 5. Duration of test
  - 6. Test equipment
  - 7. Test results
- B. Partial system may be done at the Contractor's option except tests shall be completed:
  - 1. For each phase designated by contract documents
  - 2. In accordance with building contracts schedule for completion
  - 3. As required to turn over portions of the system for the Owner's use
- C. Reports shall include but not be limited to:
  - 1. Tests during construction
  - 2. Manufacturer's factory test reports
  - 3. Equipment start-up reports
- D. Reports shall be submitted within ten days of test completion.

3.2 ENGINEER REVIEW:

- A. The A/E shall, at his discretion, recheck any or all of the test work. Provide ample number of technicians and test equipment to perform the tests required.
- B. All systems not accepted shall be retested.

- C. Systems shall be retested and rechecked until accepted by all parties.

3.3 DUCT LEAKAGE:

- A. Where leakage is determined to exceed the allowable rate, locate and repair the duct to reduce the leakage to acceptable levels.

END OF SECTION 230592

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the testing and balancing of all mechanical systems where shown on the drawings and specified hereinafter.

##### B. Description:

1. Systems shall include all equipment, operators, controls, accessories, and appurtenances.
2. These systems shall include:
  - a. Air systems (heating, ventilating, air conditioning, exhaust and recirculation distribution systems)
  - b. Vibration isolation systems
3. Air inlets and outlets shall include:
  - a. Exhaust
  - b. Relief
  - c. Outside Air
  - d. Supply
  - e. Return

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230592 - System Start-Up



### 1.3 QUALITY ASSURANCE:

#### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following (latest editions):
  - a. AABC National Standards
  - b. NEBB Standards
2. Testing and balancing shall be performed by an agency certified by the AABC or NEBB.
3. All technicians shall have a minimum of three years testing and balancing. Each test and adjustment shall be under the direct supervision of a qualified technician.
4. Testing and balancing shall be performed by one agency.

## PART 2 - PRODUCTS

### 2.1 GENERAL BALANCING PROCEDURES:

- A. All recorded data shall represent a true, actually measured, or observed condition.
- B. Any abnormal conditions in the mechanical systems or conditions which prevent total system balance, as observed by the Test and Balance Agency, shall be reported as soon as possible to the A/E.
- C. If, for any reason, a system cannot be properly balanced, it shall be reported to the A/E by the Test and Balance Agency as soon as observed.
- D. Should additional balancing devices be required, the Test and Balance Agency shall bring it to the attention of the Contractor as quickly as possible.
- E. The Test and Balance Agency shall leave all system components in proper working order including:
  1. Replace belt guards.
  2. Close access doors.
  3. Close doors to electrical switch boxes.
  4. Restore thermostats to specified settings.
- F. The Test and Balance Agency shall permanently mark the settings of all valves, dampers, and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.
- G. Systems shall be tested in each specified mode of operation. See equipment Sequence of Operation.

2.2 INSTRUMENTS:

- A. All Test and Balance work shall be performed using the required instrumentation to obtain proper measurements.
- B. Instruments shall be properly maintained and transported in such a manner as to provide protection against damage due to vibration, impact, moisture or any other condition that may render them inaccurate.
- C. Instruments shall have been calibrated within a period of six months prior to starting the project.
- D. Proof of calibration shall be maintained with the instruments.
- E. Instruments shall be calibrated upon completion of the work when required by the client to prove reliability.

2.3 AIR SYSTEMS:

- A. General Requirements:
  - 1. Total system balance shall not begin until the Test and Balance Agency has verified that start-up procedures have been performed and filters have been changed.
  - 2. The Test and Balance Agency shall measure the amperes of all fan motors before total system balance is started and shall take proper steps to correct and report any overloads.
  - 3. The Test and Balance Agency shall not continue total system balance if any conditions are observed that are hazardous to the air system. This shall be reported and corrected before proceeding further.
  - 4. The Test and Balance Agency shall verify all outlets for compliance with design requirements and shall report any variations before starting total system balance.
  - 5. If during total system balance, the Test and Balance agency detects any inlet or outlet conditions that will not allow proper balancing to be performed, the A/E shall be notified immediately.
  - 6. Reports shall indicate airflow measured at unit and inlet and outlet totals.
- B. Air Outlets:
  - 1. The systems shall be balanced so that the total supply air quantity to each space shall be within -5% to +5% of the design amount.
  - 2. The pattern for all adjustable outlets shall be adjusted for proper distribution to minimize drafts.
  - 3. Outlet dampers shall not be used to provide proper branch airflow to space.

4. The test and balance contractor shall indicate on the test and balance report that the grilles provide the proper directional throw where direction throws are indicated.

C. Air Inlets:

1. Inlets on systems shall be adjusted to the required quantities with a tolerance of  $\pm 5\%$ .
2. At completion of total system balance, at least one inlet of every branch shall be fully open and at least one branch balancing damper in the system shall be fully open.
3. Return air inlets installed in ceilings where the space above the ceiling is used as a return air plenum are to be fully opened and are not to be measured or adjusted except where a specific airflow is indicated.

D. Zone Dampers:

1. Dampers installed in main trunks and branches and dampers required for system control shall be balanced within -5% to +5% of the design amount.

E. Filters:

1. Under final balanced conditions, the Test and Balance Agency shall measure and record static pressure entering and leaving each filter bank.

F. Fans:

1. The Test and Balance Agency shall set the fan RPM to provide design total CFM and the required static pressure to operate the system.
2. If proper airflow is not achieved, the Contractor shall change the belts and drives. The new drives shall be calculated by the Test and Balance Agency. The Test and Balance Agency shall reset the fan RPM to provide design total CFM.
3. Fan speed shall not exceed the maximum allowable RPM as established by the fan manufacturer.
4. The final setting of fan RPM shall not result in overloading the fan motor in any mode of operation. Dampers shall be modulated, and the amperes of the supply fan motor shall be measured to ensure that no motor overload can occur. The amperes shall be measured in the full cooling, heating, and economizer modes to determine the maximum brake horsepower.
5. After total system balancing, the following values shall be recorded:
  - a. Fan RPM
  - b. Motor voltage and amperes
  - c. Entering static pressure

d. Leaving static pressure

6. Final RPM of the constant volume supply fan shall be set to supply the required CFM with filters artificially restricted to simulate 100% loading. The Test and Balance Agency shall verify that the fan motor will not be overloaded when the system is operating with unrestricted, clean filters in place.
7. When applicable, final supply fan settings shall be based on rated wet cooling coil resistance.
8. Final RPM of the supply fan in systems having mixed air dampers shall be set to provide required CFM with the system in a logical non-modulating mode; for example, minimum outside air.

G. Coils:

1. Under final balanced conditions, the Test and Balance Agency shall measure and record static pressure entering and leaving each coil bank.

H. Mixed Air Control:

1. The Test and Balance Agency shall observe or test mixed air plenums for possible stratification. If freeze-up or other serious problems are likely, the condition shall be reported to the Architect/Engineer at once.
2. The Test and Balance Agency shall set the minimum outside air quantity to the required value. If this airflow quantity cannot be properly measured, the Temperature Method as specified in the AABC National Standards shall be utilized.

I. Static Pressure Readings:

1. Static pressure leaving the fan shall be taken as far downstream from the fan as is practical, but shall be upstream of any restrictions in the duct (such as duct turns).
2. No reading shall be taken directly at the fan outlet or through the flexible connection.
3. Static pressure entering a fan shall be measured in the inlet duct upstream of any flexible connection and downstream of any duct restrictions.

2.4 TEMPERATURE CONTROL SYSTEM:

A. In the process of Total System Balance, the Test and Balance Agency shall:

1. Work with the temperature control contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding to intended control performance.
2. Verify that all control devices are properly connected.

3. Verify that all dampers and other controlled devices are operated by the intended controller.
4. Verify that all dampers are in the position indicated by the controller (open, closed, or modulating).
5. Verify the integrity of dampers in terms of tightness of close-off and of full-open position.
6. Check the calibration of all controllers.
7. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.
8. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media.
9. Check that the sequence of operation for any control mode is in accordance with approved shop drawings. Verify that no simultaneous heating and cooling occurs.
10. Verify that all controller set points meet the design intent.
11. Check all dampers for free travel.
12. Verify the operation of all interlocked systems.
13. Perform all system verification to assure the safety of the system and its components.

## 2.5 TEMPERATURE MEASUREMENT:

- A. Provide return, supply, mixed, and outside air temperatures for each piece of equipment with cooling coils, heating coils, energy recovery or heat transfer devices.
- B. Temperatures shall be measured downstream of each fan in equipment with a cooling coil, heating coil, energy recovery or heat transfer device.
- C. Temperatures shall be measured in heating, cooling, dehumidification and neutral modes of operation.
- D. Temperature measurements at the following devices shall be provided only downstream of the device:
  1. Heaters (non-ducted)
  2. Ceiling heaters
- E. Where outside air temperature is a variable affecting other readings (such as a mixed air temperature), the outside air reading shall be given at the time of the mixed air reading.

### PART 3 - EXECUTION

#### 3.1 SUBMITTALS:

- A. The Contractor shall submit to the A/E the following information within thirty days after the award of the contract:
  - 1. The name of the Test and Balance Agency.
  - 2. Name and registration number of the certified testing technician.
- B. The Contractor shall submit to the A/E the following information within ninety days after the award of the contract.
  - 1. Detailed testing procedures including list of instruments, task performed, model and serial number and date last calibrated.
  - 2. Agenda including schedule of work with approximate duration of each phase, approximate date of field inspections, and required start date to meet scheduled completion date.
  - 3. Report forms.
- C. An approved copy of each submittal must be received by the Test and Balance Agency before work is begun.
- D. If complete submittals are not received by the A/E within the specified times, the A/E reserves the right to select the Test and Balance Agency with any additional costs incurred by the Contractor.

#### 3.2 REPORT SUBMITTALS:

- A. Provide a preliminary typed report for engineers' review.
- B. After receiving engineers' review comments and address issues, submit three copies of the Test and Balance report. Report shall have systems, subsystems, and individual readings in a sequential format.
- C. Reports can be submitted in phases such as air systems, etc.
- D. Reports shall be submitted after all modifications required by these specifications to balance system (i.e. replace impellers, belts, drives, dampers) have been made. Reports will not be accepted with comments such as damper missing, new drive required, etc.

#### 3.3 DRAWING SUBMITTALS:

- A. Test and Balance Agency shall submit plans indicating:
  - 1. All traverse locations referencing values shown in reports.

3.4 COORDINATION OF WORK:

- A. Test and Balance Agency shall not begin work on a system until system is started as required in SYSTEM START-UP specifications.

3.5 CONTRACTOR REVIEWS AND INSPECTIONS:

- A. The Test and Balance Agency shall perform one pre-construction plan check and submit comments to A/E.
- B. The Test and Balance Agency shall perform construction inspections at the following stages of each construction phase and submit comments to A/E:
  - 1. 50% completion
  - 2. 90% completion

3.6 BELTS, DRIVES AND DAMPERS:

- A. If it is determined by the Test and Balance Agency that drive changes are required, the Contractor shall change belt and drive. Drives for constant volume air handlers shall be selected for a minimum of 100% filter loading
- B. If it is determined by the Test and Balance Agency that additional balance dampers are required, the Contractor shall install additional dampers.
- C. The Test and Balance Agency shall rebalance system after changes have been made.

3.7 ENGINEER REVIEW:

- A. The A/E shall, at his discretion, recheck any or all of the test and balance work within 120 days of receipt of report. The Test and Balance Agency shall provide ample number of technicians and test equipment to perform the tests required.
- B. Upon completion of the A/E's recheck, the testing and balancing report, or portions thereof, shall be accepted or rejected. All parts not accepted shall be retested and rebalanced.
- C. Systems shall be tested, rebalanced and rechecked until accepted by all parties.

3.8 MOTOR CAPACITY:

- A. At no time shall the motor exceed full load amps. Motor shall load into service factor only if written permission is received from the engineer.

END OF SECTION 230593

## SECTION 230700 - HVAC INSULATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all mechanical equipment, piping, ductwork, and appurtenances where shown on the drawings and specified hereinafter under applicable sections of this specification.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230713 - Duct Insulation
  2. Section 230719 - HVAC Piping Insulation

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All insulation materials must have a maximum 25/50 flame/smoke rating as tested by ASTM E-84, NFPA 255 and UL 723 except where specifically noted otherwise.
2. OSHA
3. Flame/smoke rating shall be minimum 25/250 in equipment rooms where the room is not used as a plenum.

- B. Insulation thickness shall equal those recommended by ASHRAE 90.1 or as scheduled, whichever is greater. Surface temperatures shall be below 140 degrees F.

- C. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above.

- D. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facing to impart flame and smoke safety shall be permanent. The use of water soluble treatments is prohibited.

- E. Installation and materials shall meet the requirements of the International Building Codes.



- F. All insulation work shall be applied by mechanics normally employed in the trade. All insulation shall be installed in accordance with the manufacturer's recommendations.
- G. All insulation furnished under this Division of the specifications shall be the product of one manufacturer except for special applications.
- H. Manufacturers:
  - 1. The following manufacturers of sealants, adhesives, and mastics shall be:
    - a. Foster

## PART 2 – PRODUCTS

### 2.1 MASTICS, SEALANTS, AND ADHESIVES:

- A. General:
  - 1. Materials shall be as recommended by the insulation manufacturer.
  - 2. Products shall be applied as recommended by the manufacturer for that specific application.
  - 3. The number of coats and thicknesses shall meet or exceed the manufacturer's recommendation or as indicated in these specifications or on the plans, whichever is greatest (coats and thickness).
  - 4. Materials shall meet LEED requirements for low emitting products.
- B. Finish:
  - 1. When material is applied where it is to be painted, the material shall be coated, if necessary, to allow the material to be properly painted with use of special paints or primers.

## PART 3 - EXECUTION

### 3.1 GENERAL:

- A. All insulation materials shall be delivered and stored in manufacturer's container and kept free from dirt, water, chemical and mechanical damage.
- B. Insulation shall be applied by experienced workmen in a workmanlike manner.
- C. Insulation shall not be applied until all pressure testing has been completed, inspected and released for insulation application.
- D. Surfaces to be insulated shall be clean and dry.
- E. All insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

- F. Insulation shall be run continuously through walls, ceiling openings, and sleeves except where fire stop or firesafing materials are required.
- G. Items that are factory insulated shall not receive additional insulation where not otherwise specified.

3.2 INSTALLATION:

- A. General:
  - 1. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal.
  - 2. Insulation on equipment that must be opened periodically for inspection, cleaning, and repair must be constructed so insulation can be removed and replaced without damage.

END OF SECTION 230700

## SECTION 230713 - DUCT INSULATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all sheet metal duct and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230700 - HVAC Insulation

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. Federal Specification HH-I-558C Mineral Fiber Boards, Blankets and Pipe Covering.
2. ASTM C553 Standard Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications.
3. ASTM C547 Standard Specification for Mineral Fiber Performed Pipe Insulation.
4. ASTM G12 Standard Specification, Mineral Fiber Block and Board Thermal Insulation.
5. ASTM C1136 Barrier Material, Vapor (Jacket Only)
6. ASTM C916 Liner Adhesive
7. ASTM G21, G22 Fungi and Bacteria Resistant Tests
8. ASTM C1071, Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
9. UL 723 Duct Tape

- B. Duct wrap shall not exceed 25% compression.

C. Manufacturers:

1. The following fiberglass duct insulation manufacturers are acceptable.
  - a. Owens/Corning
  - b. Certainteed
  - c. Knauf
  - d. Johns Manville

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Duct insulation shall comply with the requirements of International Energy Conservation Code or these specifications, whichever is greater.
- B. If no other specific direction is provided, the spaces for duct insulation are defined as follows:
  1. Concealed:
    - a. Above ceiling.
    - b. In mezzanines.
    - c. In mechanical rooms.
    - d. Other spaces not generally considered regularly occupied spaces.
  2. Exposed:
    - a. Indoor locations generally considered regularly occupied spaces and where duct can be visible to occupants.
  3. Outdoor:
    - a. Exposed to ambient conditions including sunlight and weather.
  4. Unconditioned spaces:
    - a. Exposed to ambient temperatures but not to sunlight and weather. Typical spaces may be attics, crawl spaces, utility tunnels, chases open to the exterior, etc.

5. Return air plenum:

- a. A space is only considered a return air plenum if the unducted air returning from a space or above the ceiling of the space is from the same air handler supplying that space.

2.2 TYPES OF FIBERGLASS INSULATION:

A. Fiberglass Duct Wrap:

1. Blanket type insulation composed of glass fibers bonded with a thermosetting resin and faced with an FSK vapor retarder. The facing shall be a glass scrim reinforced laminate of aluminum foil and kraft paper bonded with a fire retardant adhesive.
2. Insulation shall be 1.00 lb./CF density, .28K @ 75 degrees F and a facing vapor transmission of .02 perms max.
3. Insulation shall be:
  - a. Owens Corning Type 100

2.3 MINIMUM THERMAL VALUES REQUIRED FOR INSULATION (UP TO 9000 CDD50 AND UP TO 9000 HDD 65):

A. General:

1. This section is intended to indicate minimum "R" values required. It is not intended to indicate duct insulation thickness. Where specific duct insulation thicknesses are indicated elsewhere in this specification or on the plans, the thickness indicated shall be provided. Where no thickness is indicated, insulation must meet the minimum "R" values.
2. If no other requirements are indicated and an R-0 is indicated, no insulation is required.

B. Supply Duct:

1. Outdoor: R-8
2. Unconditioned Space: R-8
3. Exposed: R-8
4. Concealed: R-8

C. Return Duct:

1. Outdoor: R-8
2. Unconditioned Space: R-8

3. Exposed: R-6
4. Concealed: R-6
5. Return Air Plenum: R-0

D. Exhaust Duct:

1. From motorized or backdraft damper to building exterior: R-6.
2. All other locations: R-0

E. Outside Air Duct:

1. See requirements for supply duct.

F. Plenums:

1. See requirements for supply duct.

2.4 APPLICATION OF FIBERGLASS DUCT WRAP:

A. Duct wrap is required in the following locations unless another type of insulation is specified:

1. Concealed supply duct
2. Concealed return duct
3. Concealed outside air duct
4. Concealed exhaust duct

2.5 TAPE FOR FIBERGLASS DUCT INSULATION:

- A. Tape shall be pressure sensitive joint sealing tape specifically made for the specific application in which it is used.
- B. Tape shall be 3" wide minimum and shall match the insulation finish.

2.6 DUAL WALL DUCT:

- A. No additional insulation is required.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIBERGLASS INSULATION:

- A. Fiberglass Duct Wrap Insulation:

1. Duct wrap insulation seams shall be stapled 6" on center with outward clinching staples. All seams are to be sealed with pressure sensitive tape matching the facing.
2. Where rectangular ducts are 24" in width or greater, duct wrap insulation shall be additionally secured to the bottom of the duct with mechanical fasteners such as pins and speed clip washers, spaced 18" on center (max.) to prevent sagging of insulation.

B. Tape and Mastic Installation:

1. After tape is applied, a coat of mastic shall be applied to the tape overlapping the insulation by 2" minimum.
2. Tape and mastic shall also be applied to all tears, rips, punctures, penetrations, mechanical fasteners, access doors, and all other locations as necessary to ensure a continuous vapor tight system.
3. Mastic must also be applied to any factory applied tape such as on factory insulated supply grilles, etc.

END OF SECTION 230713

## SECTION 230719 - HVAC PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including valves, mechanical couplings, fittings, flanges, strainers, expansion joints, and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230700 - HVAC Insulation

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturers:

1. The following elastomeric pipe insulation manufacturers are acceptable:
  - a. Armacell
  - b. K-Flex
2. The following pipe insert (for elastomeric pipe insulation) manufacturers are acceptable:
  - a. Aeroflex-U

### PART 2 - PRODUCTS

#### 2.1 GENERAL:

- A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.
- B. Insulation in tunnels, crawl spaces, outside and mechanical rooms not used as return air plenums shall have a maximum 25/450 flame/smoke rating. Insulation in all other locations shall have a maximum 25/50 flame/smoke rating.



## 2.2 TYPES OF INSULATION:

### A. Fiberglass Insulation:

1. Physical properties:
  - a. Thermal conductivity (k) is .25 at 100 degrees F.
2. Jacket:
  - a. ASJ jacket with or without self-sealing adhesive system
3. Insulation shall be:
  - a. Owens/Corning Heavy Density Fiberglass Insulation ASJ/SSL or ASJ

### B. Elastomeric Insulation:

1. General:
  - a. The insulation shall have a factory applied adhesive closure system.
2. Physical properties:
  - a. Thermal conductivity (k) is .27 at 75 degrees F.
  - b. Water transmission is .08 perms – inch.
  - c. Will not significantly contribute to fire.
3. Insulation shall be:
  - a. Armacell type AP Armaflex or type AP/SS

## 2.3 PIPE INSULATION APPLICATION:

### A. General:

1. All fittings, valves, and accessories in the piping system shall be insulated similar to the piping system.
2. Fiberglass pipe insulation is required for the following duct systems:
  - a. Boiler combustion air ducts

### B. Fiberglass Pipe Insulation:

1. Fiberglass pipe insulation is required for all piping systems required to be insulated except where other types of pipe insulation are specified.

C. Elastomeric Pipe Insulation:

1. Elastomeric pipe insulation not permitted on the following:
  - a. Where not UL approved for fire rated assemblies.
  - b. Where details or notes specifically require another insulation type.
2. Elastomeric pipe insulation may be provided at contractors option (except where not permitted above) for the following systems in lieu of fiberglass insulation.
  - a. All piping indicated on the Elastomeric Insulation Schedule or, if none provided, on pipe where 1/2" or 3/4" fiberglass insulation required.

2.4 FITTINGS:

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Fiberglass Pipe Insulation:

1. Piping (up to 1-1/4"):
  - a. Fittings may be mitered at contractor's option.
2. Piping (1-1/2" and larger):
  - a. Fittings shall be insulated with 3/4 PCF density, all service faced FSK duct wrap, 2" thick.

C. Elastomeric Pipe Insulation:

1. Piping (up to 3/4"):
  - a. Fittings may be mitered at contractor's option.

2.5 FINISH (OUTDOOR REFRIGERANT PIPING):

- A. Outdoor refrigerant piping shall be wrapped with a prefabricated, self-adhering protective membrane.
- B. The outer layer shall be UV resistant.
- C. The inner layers shall be high density cross linked polymer film with a layer of asphalt adhesive.

- D. The basis of design wrap shall be
  - 1. MFM FlexClad-400 or equal

2.6 ADDITIONAL INSULATION REQUIREMENTS:

- A. Liquid Refrigerant Lines:
  - 1. Insulate liquid refrigerant lines similar to suction refrigerant lines in the following systems:
    - a. Ductless split systems
    - b. Where required by equipment manufacturers

2.7 PIPE INSERT (FOR ELASTOMERIC INSULATION):

- A. General:
  - 1. Insert shall be a closed cell, high compressive strength, foam insulating pipe support.
  - 2. The insert shall be lined with a closed cell EPDM foam rubber and encased in a zero perm weatherproof membrane.
- B. Properties:

Compressive Strength (at yield)	314 PSI
Thermal Conductivity	.312K
Water Absorption (by weight)	<7%
Water Vapor Permeability	0.0 Perm
- C. Insert shall be sized for the pipe on which it is installed and the thickness of the adjacent insulation.
- D. Manufacturer shall be:
  - 1. Aeroflex-U

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL:

- A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.
- B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 ELASTOMERIC INSULATION SCHEDULE:

- A. Refrigerant Suction Lines, Hot Gas Reheat Lines, and Liquid Lines:
  - 1. All pipe - 1" thk.
- B. Condensate Drains (not outdoors):
  - 1. Up to 2" pipe – ¾" thk.

PART 4 - EXECUTION

4.1 INSTALLATION:

- A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.
- B. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.
- C. Butt joints and seams of elastomeric insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.

4.2 FITTINGS:

- A. General:
  - 1. Apply vapor barrier to insulation and all seams.
- B. FSK Ductwrap:
  - 1. Apply pressure sensitive vapor barrier tape.

4.3 FIRERATED ASSEMBLIES:

- A. Insulation shall run through firerated assemblies.

4.4 MULTI-LAYER INSTALLATION:

- A. Joints shall be staggered.

4.5 PIPE INSERT FOR ELASTOMERIC INSULATION:

- A. Center insert on hanger or pipe support.
- B. Insert shall be installed using the insert manufacturer's adhesive to seal the insert to the adjacent pipe insulation.

- C. The insert and adjacent insulation shall be wrapped with the insert manufacturer's tape to seal and finish the installation. The tape shall wrap the insulation/insert two complete times.

END OF SECTION 230719

## SECTION 230900 - INSTRUMENTATION AND CONTROLS FOR HVAC (GENERAL)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the building environmental controls shown on the drawings and specified hereinafter.

##### B. Description:

1. Control and instrumentation work shall include:
  - a. Temperature control
  - b. Humidity control
  - c. Airflow control
  - d. Equipment interlock and controls
  - e. Wiring for automatic controls

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230900.01 - Controls for HVAC (Dampers and Valves)
  2. Section 230900.02 - Controls for HVAC (Flow Measurement)
  3. Section 230904 - Building Automation System
  4. Section 230905 - Smoke Devices and Systems

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:
  - a. Underwriters Laboratories

- b. NEMA Standards
  - c. National Electric Code
  - d. Scientific Apparatus Makers Associates Standard PMC 20.1 for Process Measurement and Control Terminology
  - e. Scientific Apparatus Makers Associates Standard PMC 20.2 for Process Control Performance
  - f. NFPA 90A
  - g. NFPA 72E Standard for Automatic Fire Detector
- B. Control circuit wiring shall meet NFPA Standard 70, Article 725, for remote control, low energy power, low voltage power and signal circuits.
- C. The building environmental controls shall be provided by the Building Environmental Controls Contractor.
- D. The Building Environmental Controls Contractor shall have a local office within a 75 mile radius of the job site, staffed with factory trained engineers. The engineers shall be capable of providing instructions and maintenance service on all system components.
- E. The Building Environmental Controls Contractor shall have a 5-year successful history in the design and installation of building systems and automatic temperature controls similar in performance to that specified herein and shall be prepared to evidence this history as condition of acceptance and approval prior to bidding.
- F. The Building Environmental Controls system shall be installed by competent controls mechanics who are full time employees of the Building Environmental Controls Contractor.
- G. The Environmental Control Contractor shall be responsible for the quality and satisfactory operation of the devices within the system and for the overall performance of the specified air flow control system.
- H. All control equipment shall be the product of one manufacturer whenever practical.
- I. Manufacturers:
- 1. The following control manufacturers are acceptable:
    - a. Siemens
  - 2. The following steel control guard manufacturers are acceptable:
    - a. VPI
    - b. Shaw Perkins

3. The following plastic control guard manufacturers are acceptable:
  - a. STI
4. The following gas detection system manufacturers are acceptable:
  - a. Honeywell Analytics
5. The following three phase voltage monitors are acceptable:
  - a. Motor Saver
6. The following needlepoint bipolar ionization manufacturers are acceptable
  - a. GPS
  - b. Plasma Air International
  - c. Phenomenal Aire

## PART 2 - PRODUCTS

### 2.1 SYSTEM:

- A. Provide all thermostats, humidistats, sensors, transmitters, controllers, actuators, control panels, conduit, wiring, accessories and appurtenances for a complete building environmental control system.
- B. Provide switches, fuses, disconnects and all other devices necessary for protection and convenient operation of system.
- C. The contractor shall be responsible for providing power wiring, conduit, breakers and final connections for the following equipment and components unless specifically shown on electrical plans:
  1. Control devices
  2. Smoke devices
  3. Smoke dampers
  4. Motorized dampers
- D. The control system shall be on (emergency) (normal) power.

### 2.2 ELECTRIC/ELECTRONIC CONTROLS:

- A. General:
  1. All control conduit, wires, and control devices shall be furnished and installed under this division except where specifically indicated otherwise.



2. It shall not be permitted for conduit installed under another division or section of these specifications to be used for installation of wires under this Division or section of the specifications.
3. All control wiring shall be run in conduit.
4. Conduit shall be provided in accordance with the Electrical Division of this specification unless noted otherwise in these specifications.

B. Conduit:

1. All line voltage and low voltage wiring shall be run in (minimum 1/2 inch) (minimum 3/4 inch) conduit, or wireways if separated from wires insulated for less than 600 volts by approved barriers.
2. Metallic conduits installed in or below slabs or below grade shall be galvanized rigid steel or IMC and shall be protected against corrosion with two field coatings of asphaltum black varnish or approved equal.
3. All metallic conduits installed below slab or below grade shall be provided with watertight couplings.
4. Conduits passing through concrete foundation walls or floor slabs below grade or below ground water level shall be provided with waterproof conduit entrance sealing sleeves.

C. Wiring:

1. Wiring for low voltage circuits generally shall be No. 18B and S gauge or larger RSH-2 heat resistant.
2. Cables of two or more conductors, not smaller than 22 B and S gauge if shielded or No. 18 B and S gauge if not shielded, may be used for low voltage d-c and electronic circuits carrying less than 1.50 amperes, in lieu of individual wires.
3. Cables carrying a-c circuits sensitive to external fields shall be shielded.
4. Cables having fewer than 12 conductors shall have thermoplastic or rubber insulation for 300 volts or more and a heavy outer braid or thermoplastic sheath. Shields shall be grounded to building's grounding system, using wire not smaller than No. 14 B and S gage. Shields shall not be grounded to conduit systems or building piping.
5. Cables shall terminate in solder or screw type terminal strips.
6. Cables shall not be tapped at intermediate points.
7. All wires, whether individual or in cables, shall be color coded and numbered for identification in accordance with the National Electric Code.
8. Where wire is not in conduit, such as termination at equipment, etc., all exposed wire shall be plenum rated.

D. Transformers:

1. Transformers shall be furnished and installed for supplying current to control equipment as required. Transformers shall conform to NEMA standards, shall be capable of supplying 125 percent the connected load, shall be enclosed in U.L. listed cabinets, ventilated, with conduit connections, and provided with fused disconnect switches on primary side and on secondary side.

E. Terminals:

1. All terminal strips shall be numbered.

F. Control Voltage:

1. Voltage shall not exceed 120 volts where located within occupied spaces and not integral with the equipment (such as a unit mounted thermostat).
2. Voltage in wet or damp locations shall not exceed 24V.

G. Wiring (S.C. school renovations):

1. At the contractor's option, all control wiring above ceilings may be supported by J hooks, 3 ft. on center, in lieu of in conduit. Plenum rated cable shall be provided where cabling is not in conduit.

2.3 SPEED SWITCHES:

- A. Speed switches, rheostats, and other fan speed control devices may be furnished by either the equipment manufacturer or the controls contractor.

2.4 THERMOSTATS AND HUMIDISTATS:

A. Thermostats:

1. Thermostats shall have minimum adjustable operating range of 20 degrees F above and below design setpoint.
2. Wall mounted room thermostats shall be (with) (without) thermometer and (with) (without) setpoint indicator.
3. Thermostat shall (not) have external adjustments with internal stops for minimum and maximum settings.

B. Humidistats:

1. Humidistats shall have minimum adjustable operating range of 15 percent above and below design setpoint.
2. Control setting shall be accessible by removal of locking cover.

C. Remote Thermostats:

1. Remote bulb type shall have liquid filled capillary and bulb.
2. Provide sensor well in all piping.

2.5 DDC THERMOSTATS:

A. General:

1. Provide electronic thermostat with sensor, night setback, night override switch, and digital setpoint adjustment. The digital setpoint adjustment only shall be visible through cover. Override switch duration and setpoint adjustment range shall be programmable from the front end.
2. Thermostats shall connect to unit controller via communication cable with a standard jack. The thermostat shall also have a connection available for field monitoring.
3. Devices installed in duct system shall be specifically designed for duct systems.

B. Construction:

1. Device shall be polymer construction.
2. Circuit boards shall be coated.

C. Technical Specifications:

1. Ambient Operating Conditions: 32 deg F to 140 deg F, 0 to 100% RH
2. Accuracy:  $\pm .34$  deg F @ 70 deg F (thru film nickel)

2.6 DDC HUMIDISTAT:

A. General:

1. Provide electronic humidistat without setpoint adjustment.
2. Humidistat shall connect to unit controller via communication cable with a standard jack. The humidistat shall also have a connection available for field monitoring.
3. Devices installed in duct system shall be specifically designed for duct system.
4. (Where humidistat and thermostat are located adjacent to each other, at the manufacturer's option, a combination humidity transmitter and temperature sensor may be provided.)
5. (The humidistat shall be a separate device from other control sensors/devices.)

B. Construction:

1. Devices shall be polymer construction.
2. Circuit boards shall be coated.

C. Technical Specification (@ 77 deg F):

1. Ambient operating conditions: 32 deg F to 140 deg F, 0 to 100% RH
2. Accuracy:  $\pm 3\%$  RH for 20-80% RH  
 $\pm 5\%$  RH for 5-20% and 80-95% RH
3. Temperature Coefficient: .12% RH/deg F
4. Response: less than 120 sec between 50-90% RH
5. Offset Adjustment:  $\pm 5$

2.7 SENSORS, TRANSMITTERS, AND OTHER CONTROL DEVICES:

A. General:

1. Provide the type device specified for the specific application. Where the device is not specifically indicated, provide the device best suited to provide the control specified.

B. Location of device:

1. Device shall be located as indicated on the drawings or as stated in the specifications.
2. Where no device location is indicated or specified, the device shall be located as recommended by the manufacturers to provide the best practical results.
3. Where the location indicated on the drawings or stated in the specifications does not provide the best practical results, the manufacturers shall provide recommendations for relocating the device.
4. It shall be the responsibility of the contractor to identify all conflicts between indicated device locations and manufacturers recommended locations prior to installation of any related components (i.e., sensor wells, conduit, etc.).

2.8 SAFETY DEVICES:

A. General:

1. Safety devices including, but not limited to, the following shall be hard wired to perform their required function. Status, where specified, shall be monitored by the building automation controls system and initiate other sequences where required:

- a. Condensate overflow switch
- b. Smoke alarm, via unit duct detector, where shutdown sequence is specified to be by mechanical.

## 2.9 CONTROL PANELS:

### A. General:

1. All controllers, relays, switches, etc., for equipment shall be mounted in enclosed control panels with key lockable, piano hinged door.
2. Location of each panel shall be where indicated on plans, approved by A/E, and convenient for adjustment and service.
3. Label each panel properly identifying function or service of panel and all surface mounted devices.
4. Control panels shall be extruded or formed, cold-rolled steel, enamel surfaced, with full length mounting brackets, drilled wall mounting holes.
5. The control panel shall be key lockable.
6. Provide a 24V control transformer.

## 2.10 CONTROL GUARDS:

- A. Provide heavy duty locking metal control guards for the following locations:
  1. Diesel Lab
- B. Guards shall be sized for device(s) enclosed.
- C. Steel control guards shall be constructed from 16 gauge steel with a beige finish.
- D. Provide the following accessories:
  1. Mounting base
  2. Surface mounted adapters (existing walls)
- E. Steel control guards shall be:
  1. VPI Model TG

## 2.11 GAS DETECTION SYSTEM:

- A. The gas detection system shall be controlled by a central gas detection monitor with real-time gas reading and selective alarm activation.
  1. The central gas detection system allow up to 126 programmable zones.

2. System shall have a BACnet interface.
  3. System shall be capable of turning on the exhaust fans.
  4. Basis of design central gas detection monitor shall be:
    - a. Honeywell Analytics 301C
- B. Gas detector shall consist of a wall mounted detectors that detect Carbon Monoxide (CO) and Nitrogen Dioxide (NO<sub>2</sub>).
1. Gas detectors shall be daisy-chained through a RS-485 cable back to the controller. Cable shall be routed in conduit.
  2. Locate gas detectors per manufacturer's recommendations.
  3. Provide Nema 4X enclosure
  4. Basis of design gas detector shall be:
    - a. Honeywell Analytics E3Point

#### 2.12 FLOAT SWITCH:

- A. General:
1. Float switch shall include a sealed, waterproof reed/magnet float switch with no exposed electrical contacts.
  2. Float shall be prewired with 6 ft. long, 18 ga. lead cables.
  3. Switch shall be tested to UL 508 and UL listed for 24V AC.
  4. Float shall attach to drain pan with stainless steel clips.
- B. Locations:
1. All drain pans.
- C. Manufacturers shall be:
1. SMD Research Safe-T-Switch Model SS3.

#### 2.13 EQUIPMENT STATUS:

- A. Equipment status shall be provided by solid state current sensors.
- B. Sensor shall have non-polarity sensitive outputs, trip point adjustment, trip LED, and power LED.

2.14 THREE PHASE VOLTAGE MONITOR:

- A. Monitor shall be autoranging type that detects single phasing, low voltage, phase reversal or voltage unbalance. When a harmful condition exists, the output relay shall deactivate. When the harmful condition is removed, the relay shall reactivate.
- B. The three phase voltage monitor shall be field or factory installed on all three phase equipment.
- C. If three phase protection is already provided with the equipment via the VFD or other means, the control contractor does not have to provide additional three phase protection.

2.15 LOW VOLTAGE SWITCHING:

- A. General:
  - 1. Where low voltage switching is required, switch shall be 24V DC.
  - 2. Low voltage switching required in all damp areas or areas where water could be present.

2.16 BIPOLAR IONIZATION:

- A. General:
  - 1. The electrodes shall be needlepoint type. Needlepoints shall not protrude into the airstream.
  - 2. The bipolar ionization system shall be capable of:
    - a. Effectively killing microorganisms downstream of the bipolar ionization equipment (mold, bacteria, virus, etc.).
    - b. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
    - c. Reducing space static charges.
    - d. Reducing space particle counts.
  - 3. The bipolar ionization system shall produce equal amounts of positive and negative ions.
  - 4. Relative humidity from 0 – 100%, condensing, shall not cause damage, deterioration, or dangerous conditions to the air purification system.
  - 5. Bipolar ionization units shall be tested and listed by either UL or ETL according to UL Standard 867 – Electrostatic Air Cleaners.
  - 6. The operation of the electrodes or bipolar ionization units shall conform to UL 867 with respect to ozone generation.

B. Electrodes:

1. Each plasma generator shall include the required number of electrodes and power generators sized to the air handling equipment capacity.
2. Ionization output from each electrode shall be a minimum of 5 million ions/cc when tested at 2" from the ion generator.

C. Duct Mounted Units:

1. Ion generators shall be furnished with a factory-equipped gasketed mounting flange to prevent air leakage.
2. Ion generators shall contain a built-in power supply and operate on 24V AC.

D. Air Handler Mounted Units:

1. The entire cooling coil shall have equal and adequate ionization distribution across the face of the coil.
2. Ion generators shall be mounted in a linear configuration to minimize space required. The ion generators and mounting bar shall be 4" deep or less.
3. The power supply shall accept the following voltages: 12V DC; 24V AC; 120V AC; or 230V AC. Power from the power supply to the ionization generators shall be 12V DC.

E. Electrical:

1. Generators shall include internal short circuit protection, overload protection, and automatic fault reset.
2. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating.
3. The power supply shall have an On/Off switch and power indicator LED.

F. Control:

1. Generators shall include an external control interface to monitor generator status and alarm.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

A. General:

1. The Building Environmental Controls Contractor shall be responsible for a complete operational system.



2. The installation shall include:
  - a. Drawings
  - b. Supervision
  - c. Interlocks
  - d. Adjustments
  - e. Verification
3. Location of sensing elements shall be the responsibility of the installer.
- B. Wiring splices shall not be permitted in electrical panelboards, junction boxes and switchgear.

### 3.2 THERMOSTATS, HUMIDISTATS AND SWITCHES:

- A. General:
  1. Install all devices as recommended by manufacturer.
  2. When device is provided by the control contractor, the control contractor shall be totally responsible for all coordination with the equipment supplier to ensure compatibility of components to meet the requirements of the equipment manufacturer and the control sequence.
- B. Installation:
  1. Mount control device 4'-0" above finished floor to top of device's control mechanism unless noted otherwise.
  2. Thermostats mounted on exterior walls shall be mounted on a thermally insulated sub-base.
  3. When location is not shown, Contractor shall assume the most remote location served by unit. Coordinate exact location with A/E.
  4. Contractor shall coordinate location of thermostat, humidistats, and switches with final architectural plans and actual field conditions to avoid locating them inside cabinets, bookcases, casework, chalkboards, tackboards and behind door swings and similar obstructions that would limit access or limit the ability to properly sense space conditions.

### 3.3 REMOTE THERMOSTATS:

- A. Thermostats not shown on plans shall be mounted in convenient locations on duct, in mechanical space or on equipment. Provide access doors for sensor and for thermostat.

3.4 ELECTRIC/ELECTRONIC CONTROLS:

A. Wiring:

1. All control wiring within starters (and motor control centers) shall be installed in a workmanlike manner and neatly laced.
2. All wiring installed in manholes, below grade, or below ground water level shall be made up with waterproof connections.
3. Wiring in manholes shall be continuous thru manholes.

B. Conduit:

1. Conduit sleeves thru non-waterproofed walls and floors shall be grouted and caulked on both sides of wall.

C. Existing facilities:

1. Control wiring and conduit shall be installed in existing walls, slabs, and ceilings.
2. Where conditions do not permit installation of conduit and wiring in existing walls, slabs, and ceiling; and, when approved by the engineer, wire mold and similar finished enclosures may be provided.
3. Conduit and wiring shall be installed above existing ceilings except where removal of existing ceilings is specifically identified in other dimensions of work (if any). The Contractor shall be responsible for removal of all other existing tile/grid and replacement of the tile/grid as necessary. Any damaged tile/grid shall be replaced by the Contractor at the Contractor's expense.

3.5 DEVICES ON EXTERNALLY INSULATED DUCTS:

- A. Devices mounted on externally insulated ducts shall be mounted on standoff brackets to allow proper installation of duct. If device must be mounted directly to duct for proper operation, standoff bracket may be deleted.

3.6 GARAGE GAS DETECTION SYSTEM:

- A. A factory-authorized service representative shall perform start-up of the system. A full test of all alarm setpoints with calibration gases shall be performed and a written report submitted to the engineer.

3.7 SPEED SWITCHES:

- A. If switch is not factory installed on the unit, the control contractor shall field install the switch.

3.8 FLOAT SWITCH:

- A. Secure bracket to drain pan with screw.

- B. Verify float is properly positioned.

3.9 BIPOLAR IONIZATION:

- A. Submittals:

- 1. Air handler bipolar ionization generator submittals shall include dimensional drawings showing the units in which the generators are to be installed. The submittal shall include documentation stating that the installation requirements have been coordinated with the air handle manufacturer.

- B. Installation (Air Handler Bipolar Ionization Generators):

- 1. Air handler bipolar ionization generators shall be factory or field installed. If field installed, installation shall be in strict accordance with manufacturer's written recommendations.
  - 2. The ionization generators shall be wired to the remote mounted power supply.
  - 3. Install ion sensor in duct system where accessible for servicing.

END OF SECTION 230900

## SECTION 230900.02 - CONTROLS FOR HVAC (FLOW MEASUREMENT)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of flow measurement devices shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230900 – Instrumentation and Controls for HVAC (General)

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:
  - a. Underwriters Laboratories
  - b. NEMA Standards
  - c. National Electric Code

- B. All flow measurement equipment shall be the product of one manufacturer whenever practical.

##### C. Manufacturers:

1. The following airflow measurement (thermistor) manufacturers are acceptable:
  - a. Ebtron
  - b. Fluid Components International
  - c. KURZ Instruments
  - d. Sierra Instruments

### PART 2 - PRODUCTS

2.1 AIRFLOW MEASUREMENT (THERMISTOR):

A. General:

1. Device shall be thermistor type capable of continuously monitoring airflow volume and temperature. Each sensor point shall be independently reported to the transmitter.
2. Device shall be suitable for insertion in mounting, standoff mounting, or internal mounting to meet specific application.
3. All components shall be provided by the sensor manufacturer.
4. The entire sensor and transmitter assembly shall be UL listed.

B. Sensor Probe:

1. Probe shall be (gold anodized 6063 aluminum alloy) (316 stainless steel).
2. Probe shall have a UL plenum rated connecting cable.
3. Probes shall be "plug and play" and not have to be matched to a specific transmitter.
4. All hardware shall be stainless steel.

C. Sensor:

1. Sensor shall use thermal dispersion technology with two hermetically sealed industrial grade thermistor probes at each measurement location.
2. Sensor calibration shall be stored in the sensor probe and be calibrated in the factory to NIST traceable airflow and temperature standards.
3. The sensor shall not require field calibration when installed in accordance with manufacturer's requirements.
4. Sensor shall be sealed in a glass filled (polypropylene) (kynar) housing.

5. Performance:

- |    |                             |   |                      |
|----|-----------------------------|---|----------------------|
| a. | Sensor accuracy             | - | $\pm 2\%$ of Reading |
| b. | Temperature accuracy        | - | $\pm .15$ degrees F  |
| c. | Operating temperature range | - | -20 to 160 degrees F |
| d. | Operating humidity range    | - | 0 to 99% RH          |
| e. | Calibration range           | - | 0 to 5000 FPM        |
| f. | Duct airflow accuracy       | - | $\pm 3\%$ of Reading |

g. OA intake airflow accuracy  $\pm 5\%$  of Reading

6. Sensors shall be provided (min.) as follows:

- |    |                              |   |            |
|----|------------------------------|---|------------|
| a. | Area less than 1 sq. ft.     | - | 2 sensors  |
| b. | >1 to 2 sq. ft.              | - | 4 sensors  |
| c. | >2 to 4 sq. ft.              | - | 6 sensors  |
| d. | >4 to 8 sq. ft.              | - | 8 sensors  |
| e. | >8 to 12 sq. ft.             | - | 12 sensors |
| f. | >12 to 14 sq. ft.            | - | 14 sensors |
| g. | Area greater than 14 sq. ft. | - | 16 sensors |
| h. | Fan inlets                   | - | 2 sensors  |

D. Transmitter:

1. Transmitter shall utilize industrial grade components.
2. Transmitter shall include:
  - a. Inputs and outputs shall be fused, protected, and internally isolated from the power supply.
  - b. Serial RS-485 interface with field selectable protocol.
  - c. Output signal offset/gain with digital adjustment.
  - d. Adjustable digital filter.
  - e. 4-20 ma or 0-10 VDC, field selectable, scalable and isolated analog signals.
3. Transmitter shall be capable of performing sensor and transmitter diagnostics and shall perform a full system checkout on power up.
4. Transmitter shall have a sensor detection system to ignore malfunctioning sensors and provide a visual alarm.
5. Transmitter shall be capable of displaying individual sensor airflow and temperature readings.
6. Display shall be 16 character alpha numerical.
7. The operating temperature range for the transmitter shall be -20 to 120 degrees F.
8. 24V AC power connection internally fused.

9. If exposed to ambient conditions, enclosure shall be NEMA 4.
10. Transmitter shall be:
  - a. Ebtron model GTx116

### PART 3 - EXECUTION

#### 3.1 AIRFLOW MEASUREMENT:

- A. Manufacturers shall submit detailed drawings of an airflow measurement device in which the airflow measurement device is to be installed and the system component (duct, hood, air handler, etc.).
- B. Submittal shall include test data to verify compliance with accuracy at all required airflows in the configuration the assembly to be installed.
- C. If the test and balance airflow measurements and the sensor airflow measurements disagree by an amount determined to be unacceptable by the Engineer, the sensor manufacturer shall visit the jobsite to review the installation of each location of airflow measurement in question. The manufacturer shall re-calibrate the sensors in the field if necessary to provide accurate readings.

END OF SECTION 230900.02

## SECTION 230904 - BUILDING AUTOMATION SYSTEM

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the building automation system shown on the drawings and specified hereinafter.

##### B. Description:

1. The work shall include, but not be limited to, the following:
  - a. Field programmable digital system controller(s).
  - b. Digital transmission system.
  - c. Field programming to perform monitoring and control functions specified herein and on point schedule.
2. All sensors, actuators, transducers, solenoids, transformers, wiring and appurtenances shall be provided for a complete building automation system.
3. Digital controller shall include the distributed microprocessors.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230900 - Instrumentation and Control for HVAC (General)

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All equipment and components shall comply with all local codes and ordinances, and meet or exceed the following standards:
  - a. American Society for Testing and Materials ASTM
  - b. Institute of Electrical and Electronic Engineers IEEE
  - c. National Electrical Manufacturers Association NEMA



- d. Underwriters Laboratory, UL (UL 916)
  - e. FCC Regulation, Part 15, Section 156
  - f. National Fire Protection Association NFPA
- B. All the equipment shall have the UL label.
- C. Manufacturers shall be:
- 1. Siemens

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. The control system shall consist of high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Operators shall be able to perform all normal operator functions through the web browser interface including downloading memory, parameters, and schedules to any module. The system shall be capable of interfacing with Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA).
- B. The system shall support Wb services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization (WS-I) Basic Profile 1.0 or higher.
- C. The system shall be capable of future expansion to include monitoring of occupant card access, fire alarm, lighting control systems, cameras and security systems.
- D. The control algorithm shall be proportional and integral. Derivative functions are required where stability of the controller is not likely with PI algorithms.
- E. A control panel used to control equipment on a floor shall typically not be used to control equipment on any other floor (i.e. Panel for terminal units for first floor terminal units shall not be used to control second floor terminal units).

### 2.2 BacNet COMMUNICATION PROTOCOL:

- A. The system shall use the BacNet protocol for communication to the operator workstation or web server and for communication between control modules. Schedules, setpoints, trends, and alarms shall be BacNet objects and shall conform to ANSI/ASHRAE Standard 135-2004, BacNet.

### 2.3 DIGITAL CONTROLLER COMPONENTS:

- A. General:
  - 1. Each controller shall consist of the following:
    - a. Enclosure with keyed hinged door and mounting brackets

- b. Power assembly
- c. System microprocessors
- d. Communications board
- e. Field termination board

B. Power Assembly:

- 1. The power assembly shall consist of :
  - a. Transformer
  - b. Filter to eliminate transients
  - c. Power regulator/surge suppresser
  - d. Battery charging circuit
  - e. Battery with 24 hour backup for RAM

C. Display:

- 1. The digital display shall be programmed to display analog variables, binary conditions, off normal scans and other analog and binary information required for analysis and adjustment of the system being controlled.

2.4 COMMUNICATIONS:

A. General:

- 1. All digital devices shall be assigned a numeric address.
- 2. Communications, commands and responses shall be digital.
- 3. Communications hardware shall include all encryption, filtering, amplifications diagnostics and error lodging.
- 4. Provide surge suppresser.

2.5 DIGITAL CONTROLLER CAPABILITIES:

A. Field Programmable:

- 1. The controller shall contain all necessary mathematics, logic, utility functions and all standard energy calculations and control functions in ROM to be available in any combination for field programming the unit. These routines shall include but not be limited to:
  - a. Math routines:

- 1) Basic arithmetic
  - 2) Binary logic
  - 3) Relational logic
  - 4) Fixed formulas for psychrometric calculations
- b. Utility routines for:
- 1) Process entry and exit
  - 2) Keyboard functions
  - 3) Variable adjustments and output
  - 4) Alarm indication
- c. Control routines for:
- 1) Signal compensation
  - 2) Loop control
  - 3) Energy conservation
  - 4) Timed programming
2. Final field programs shall be stored in battery backed up RAM.
- B. Calibration Compensation:
1. The digital controller shall sense the voltage being supplied to the resistance sensing element and through firmware and shall compensate for power supply changes due to ambient temperature changes at the power supply.
- C. Diagnostics:
1. The digital controller shall continuously perform self diagnostics. All malfunction shall alarm the front end system.
- D. Default Operating Procedure and Alarms:
1. All variables shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.
  2. All alarms shall be indicated at the digital controller and at the front end system.

- E. Energy Management Functions:
  - 1. The controller shall be capable of performing the following energy management functions:
    - a. Time of day scheduling
    - b. Start/Stop optimization
    - c. Peak demand limiting
    - d. Duty cycling (temperature compensated)
    - e. Economizer control
    - f. Enthalpy changeover
    - g. Occupied/Unoccupied mode
- F. User Specified Programs:
  - 1. The controller shall be capable of generating programs specified by the user including:
    - a. Intermediate season control (dead zone)
    - b. Trending of variables
    - c. Historical data storage
    - d. Totalizing
    - e. Holiday and event programming
- G. Control Loop Compensation:
  - 1. Control loop compensation shall include:
    - a. Hysteresis correction
    - b. Limited control output
    - c. Ramp output
    - d. Anti-reset windup
- H. Access Levels:
  - 1. The controller shall have a minimum of three levels of passwords as follows:
    - a. Level One - Read all setpoints

- b. Level two - Program occupied periods
- c. Level Three - Program all setpoints and programs

## 2.6 GRAPHICS:

- A. Graphics shall operate thru the microprocessor and shall be dynamic and animated.
- B. The graphic software shall display and update current control point data.
- C. Notification of alarms from the panels must be provided on the graphic display while the system is in graphics mode.
- D. A library of HVAC symbols shall be provided for use in generating custom displays. The graphic symbols shall include fans, pumps, valves, chillers, air handlers, cooling towers, rooftop units and boilers.
- E. The graphic display shall indicate alarm conditions for each air handling unit.
- F. The graphic display shall display a global graphic for each building which shall include status of air handling units, smoke exhaust fans, exhaust fans, dampers and alarm conditions.
- G. Fireman's Smoke Control Panel (FSCP) graphics and points to be displayed at the control operator's terminal in a similar graphic layout as on the FSCP face.
- H. The following graphics shall be generated and installed under the contract:
  - 1. Site location
  - 2. Building sites
  - 3. Floor plan
  - 4. Equipment rooms
  - 5. Each heating and cooling unit
  - 6. Each 100% outside air system
  - 7. Each exhaust fan
  - 8. Ambient conditions

## 2.7 SURGE PROTECTION:

- A. Surge suppression shall be provided on communications lines and power sources at each control panel.
- B. Surge suppression shall be type recommended by manufacturer to provide maximum protection of system components.

2.8 OWNERS WITH EXISTING BUILDING AUTOMATION SYSTEMS:

- A. When this facility is brought on-line, the existing software shall be upgraded as necessary to support the graphics, sequences and other functions of the building automation system.
- B. The data, information and graphical representations of the systems at this facility shall be equal to or greater than that installed for other college facilities or as indicated in these specifications, whichever is greater.

2.9 VARIABLE FREQUENCY DRIVE (VFD) COMMUNICATION:

- A. Building automation system must be able to fully communicate and change setpoints with variable frequency drives. Communication must be direct without gateway or other external translating devices.

2.10 BACK-UP POWER:

- A. Provide a UPS for all panels in this specification.

2.11 SETPOINT CHANGES:

- A. Setpoints shall be changed on function blocks. User must also be able to change setpoints without having to go to the function blocks. Acceptable methods include changing setpoints on a "Properties Page" or on the system graphics.

PART 3 - EXECUTION

3.1 OPERATION:

- A. Upon restoration of power, equipment shall be sequentially started and shall at no time exceed last demand limit setting.

END OF SECTION 230904

## SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS AND POINTS LIST

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

##### B. Description:

1. Points shown for equipment shall be for each item of equipment except:
  - a. When noted otherwise.
  - b. When exhaust fans are grouped together.

#### 1.2 RELATED DOCUMENTS:

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

- ##### B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 230900 - Instrumentation and Control for HVAC (General)
2. Section 230993.2 - Sequence of Operation (Air Handling Equipment)
3. Section 230993.4 - Sequence of Operation (Electric Heaters)
4. Section 230993.6 - Sequence of Operation (Single Zone Packaged Equipment)
5. Section 230993.8 - Sequence of Operation (100% Outside Air Equipment)
6. Section 230993.9 - Sequence of Operation (Various Systems)
7. Section 230993.10 - Sequence of Operation (Water Heaters/Domestic Water Systems)

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 SEQUENCE DESCRIPTION AND DEFINITIONS:

##### A. General:

1. These sequence descriptions and definitions shall apply to all sequences unless sequence specifically indicates otherwise.

B. Morning Warm-Up/Cool-Down:

1. This mode is the mode between night setback and normally occupied mode and is used to bring area served from unoccupied conditions to conditions required for occupancy.
2. This mode typically will operate with outside air systems closed or de-energized.
3. The start time of this mode shall be determined by the building automation system based upon space temperatures, building characteristics, outside temperature, and historical ability of each system to warm up or cool down the building.

C. Night Setback:

1. This mode is the unoccupied mode.
2. This mode is a timed function of adjustable duration.
3. This mode typically will operate with outside air systems closed or de-energized and is used primarily to maintain unoccupied space temperature (adjustable) or space humidity level (adjustable).
4. All HVAC equipment required to maintain space conditions shall be energized in this mode.

D. Override:

1. When override is activated, the system shall operate with that zone, equipment, or system in the occupied mode.
2. At the end of the override time period, the zone equipment or system shall return to the mode scheduled at that time.

E. Setpoints:

1. All time durations and temperature setpoints shall be field adjustable.
2. Temperatures shall be settable to any temperature.
3. Time of day operations shall be settable to any time.
4. Time delays shall generally be settable as follows:
  - a. 0-60 second delay: settable from 0-300 seconds.
  - b. 0-5 minute delay: settable from 0-60 minutes.

2.2 OUTSIDE AIR CONTROL:

- A. Where motorized dampers are specified, the dampers shall open to maintain the airflow quantity indicated on the equipment schedule.



- B. Where airflow measuring stations are provided in the outside air intake, the outside air damper shall maintain airflow measuring station setpoint.
- C. Where airflow measuring stations are provided in the supply and return airstreams, the outside air damper shall modulate to maintain the required differential airflow.

### 2.3 SETPOINTS:

- A. In general, the specification indicates setpoints or range of setpoints for most devices. The contractor shall adjust setpoints in the following manner:
  - 1. As required to start-up, test, debug and otherwise ensure equipment and system is operating as intended.
  - 2. Dampers, actuators and similar devices should be left in their optimum operating position.
  - 3. Thermostats, humidistats, and similar devices should be left as indicated on drawings or in specifications. If no value is indicated, contractor should set at a reasonable value.
  - 4. Equipment and system schedules should be reviewed with the Owner and A/E prior to initiating the schedule.

### 2.4 FAILURE MODES:

- A. General:
  - 1. Initiating devices shall each be hard wired.
  - 2. Manual reset of temperature alarm and pressure alarm shall be required. Other alarms shall automatically reset unless manual reset indicated.
- B. Smoke and Fire Alarm:
  - 1. The fans shall be de-energized and smoke dampers shall shut. The fan shall de-energize as fast as practical and smoke dampers shall begin closing after fan is de-energized.
- C. High Condensate Level:
  - 1. Upon a rise in condensate level in the auxiliary drain pan, the float switch shall de-energize the unit.
- D. Duct Pressure:
  - 1. Discharge air static pressure sensors shall de-energize fans.

2.5 SPACE HEATING DEVICES:

- A. Unless stated otherwise, all devices not utilized for reheat shall be scheduled off by any of the following means:
  - 1. Night setback thermostat
  - 2. Timed schedule
  - 3. Outside air temperature setpoint

2.6 STARTER "HAND-OFF-AUTO":

- A. When in "HAND" position, equipment shall be able to run.
- B. When in "OFF" position, equipment shall not be able to run.
- C. When in "AUTO" position, equipment shall be able to run if commanded by sequence of operation.

2.7 SYSTEM OPTIMUM START:

- A. The building automation control system shall provide an optimum start sequence for the HVAC system.
- B. Optimization shall be determined by a comparison of indoor and outdoor environmental conditions and system capacities.
- C. At the completion of optimum start, the building shall be at design temperatures. This is not necessarily, and in most cases will not be, the same time as the start of the occupied period. For example, the completion of optimum start could be set at 7 am and the occupied mode set at 9 am. The occupied mode is typically when ventilation air would be energized.

2.8 ALARMS:

- A. In addition to the alarms indicated, all temperatures and other monitored or sensed conditions that fall above or below the normal range shall be alarmed.
- B. Alarms shall be assigned a level of alarm (minimum three levels - low (maintenance), high (important), and critical).

PART 3 - POINT SCHEDULE

3.1 DEFINITION OF POINTS:

- A. Binary Output:
  - 1. Control Relay - Energize/de-energize
  - 2. Hand/Off/Auto - Starter

B. Analog Output:

- |    |                 |  |
|----|-----------------|--|
| 1. | Humidification  | - Control Valve                                      |
| 2. | Economizer      | - Dampers  |
| 3. | Position Adjust | - Fan Drives<br>Pump Drives<br>Dampers<br>VAV Damper |

C. Binary Input:

- |    |                       |                                 |
|----|-----------------------|---------------------------------|
| 1. | Differential Pressure | - Fan Status<br>Pump Status     |
| 2. | Pressure Switch       | - Pressure                      |
| 3. | Flow Switch           | - Fan Status<br>Pump Status     |
| 4. | Fire/Smoke            | - Smoke Detector<br>Fire Sensor |
| 5. | Filter                | - Filter Pressure               |
| 6. | Setback Override      | - Night Setback<br>Override     |

D. Analog Input:

- |    |                 |                   |
|----|-----------------|-------------------|
| 1. | Humidity        | - Humidity        |
| 2. | Temperature     | - Temperature     |
| 3. | Static Pressure | - Static Pressure |
| 4. | Fan Speed/Load  | - Fan Drives      |
| 5. | Air Flow        | - Air Flow        |

# SYSTEM POINT SCHEDULE

POINT SCHEDULE NO. 1	SOFTWARE																										
	HARDWARE					SOFTWARE																					
	OUTPUT FROM BACS					INPUT TO BACS																					
	BINARY		ANALOG			BINARY		ANALOG			ALARMS		APPLICATION PROGRAMS														
SYSTEM	CONTROL RELAY	POSITION ADJUST	COOLING	HEATING	DEHUMIDIFICATION	REHEAT	CURRENT SENSOR	FILTER	ALARM	OUTSIDE HUMIDITY	OUTSIDE TEMP	SPACE TEMP	SPACE TEMP (AIR)	VFD ①	OA AIRFLOW	SUPPLY DEWPOINT (AIR)	COIL LAT	SPACE HUMIDITY	HIGH TEMP	LOW TEMP	RUN TIME	HIGH DEWPOINT	SCHEDULED START/STOP	S/W CHANGEOVER	OA TEMP CUT OFF	OPTIMUM START	
POINT DESCRIPTION																											
Outside																											
DHS-1 ④	•	③	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IDHP-#	•																										
EF-#	•																										
VEF-#	•																										
Gas Detection System																											
EUH-1 ②	•																										
AFMS-1																											

Failure Modes  
 O -- ON  
 • -- OFF  
 L -- Last

① INFORMATION AVAILABLE FROM THE VFD  
 ② EACH UNIT  
 ③ DAMPERS AND AIRFLOW

④ BACNet INTERFACE. SEE CONTROL SEQUENCE FOR POINTS REQUIRED.

END OF SECTION 230993

## SECTION 230993.2 - SEQUENCE OF OPERATION (AIR HANDLING EQUIPMENT)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230993 - Sequence of Operation for HVAC Controls and Points List

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 EXHAUST FANS:

- A. Fans shall be controlled as shown on the schedule.
- B. Outside air damper and supply fans shall be interlocked with exhaust fans serving the same spaces.
- C. Fans under timed control shall be off during unoccupied mode except in override mode.
- D. Provide auxiliary contacts for start/stop for all fans not temperature controlled.
- E. Spaces installed with safety sensors (carbon monoxide, etc.) shall have the fans serving these spaces energized whenever the sensors indicate an unsafe condition.
  1. Diesel Lab
- F. A motorized damper associated with a fan shall open when fan is energized.

END OF SECTION 230993.2

## SECTION 230993.4 - SEQUENCE OF OPERATION (ELECTRIC HEATERS)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230993 - Sequence of Operations for HVAC Controls and Points List

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 ELECTRIC UNIT HEATERS:

- A. Heater shall be controlled by a unit or wall mounted thermostat/flat plate sensor as shown on the plans and direct digital controller.
- B. Digital controller shall de-energize heater when ambient temperature exceeds 65 deg F (adj.)
- C. Wall mounted thermostat shall be 24V and shall have On-Off-Auto positions. Heating and fan shall cycle in auto position. Fan shall run continuously in On position.

END OF SECTION 230993.4

## SECTION 230993.6 - SEQUENCE OF OPERATION (SINGLE ZONE PACKAGED EQUIPMENT)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230993 - Sequence of Operations for HVAC Controls and Points List

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 GENERAL:

##### A. Unit Operation:

1. The indoor fan, exhaust fan, compressors, heating coil and outside air damper shall be controlled independently of each other by the direct digital controller.
2. Cooling and heating shall not operate simultaneously except where specifically specified otherwise.
3. Electric heat shall be disabled until air flow switch proves proper air flow.
4. When system is in override, the system shall operate in occupied mode.

##### B. Heating Control (Heat Pump):

1. Upon a demand for heating, the reverse cycle unit shall load compressor.

##### C. Cooling Control:

1. Upon a demand for cooling, the unit cooling sequence shall energize.
2. The compressors shall load to maintain sensor setpoint.



D. Indoor Fan Operation:

1. The fan shall run continuously when the unit is energized except where noted otherwise.

E. Morning Warm-Up:

1. Unit shall operate in heating to bring space to design temperature.

F. Unoccupied Mode:

1. When space temperatures drop below the night low limit setpoint, the unit shall energize in heating.
2. When space temperatures rise above the night high limit setpoint, the unit shall energize in cooling.

G. Failure Mode:

1. High condensate level
2. Others indicated with equipment or required by manufacturer.

2.2 SPLIT SYSTEM AND PACKAGED COOLING AND HEATING UNITS:

A. Unit Operation:

1. The unit shall be controlled by a (space) thermostat, and direct digital controller.

END OF SECTION 230993.6

## SECTION 230993.8 - SEQUENCE OF OPERATION (100% OUTSIDE AIR EQUIPMENT)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230993 - Sequence of Operations for HVAC Controls and Points List

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 GENERAL:

##### A. Unit Operation:

1. The unit shall be controlled by a direct digital controller.
2. The fans, compressors, heating coil, cooling coil and dampers shall be controlled independently of each other.
3. Cooling and heating shall not operate simultaneously except where specifically specified otherwise.
4. Gas heat shall be disabled until airflow switch proves proper airflow.

##### B. Fan Operation (Variable Speed):

1. Fans shall soft start.
2. The direct digital controller shall provide a signal to the variable frequency drives to control supply fan speed to design airflow as measured by the airflow measuring station.

##### C. Damper Operation:

1. Unoccupied Mode (unit not energized):
  - a. All dampers closed.

2. Unoccupied Mode (unit energized):
    - a. Outside air damper shall be closed.
    - b. Recirculation damper shall be open.
  3. Occupied Mode (unit energized):
    - a. Outside air damper shall be open.
    - b. Recirculation damper shall be closed.
- D. Failure Mode:
1. High condensate level:
    - a. Unit shall shut off
  2. Smoke and fire alarm:
    - a. Unit shall shut off.
  3. Power Failure:
    - a. Outside air damper shall close.
- E. Override Mode:
1. System shall operate in occupied mode.
- F. Night Setback:
1. When in cooling mode, night setback temperature shall be 80 degrees F (adj.).
  2. When in heating mode, night setback temperature shall be 60 degrees F (adj.).
- G. Temperature Control (Cooling):
1. The unit cooling shall proportionally energize when space temperature is above setpoint.
  2. If space temperature is satisfied but outside air temperature is above setpoint, the system shall remain in cooling mode and maintain a neutral supply air temperature (set at space cooling setpoint).
- H. Temperature Control (Dehumidification):
1. The unit cooling shall proportionally energize to maintain dewpoint when space humidity is above setpoint.
  2. Hot gas reheat shall modulate to maintain a neutral supply air temperature (set at space cooling setpoint).

3. If space humidity setpoint is satisfied but outside air humidity is above setpoint, the system shall remain in dehumidification mode and maintain a neutral supply air temperature (set at space cooling setpoint).
- I. Temperature Control (Heating):
    1. The unit heating shall be enabled when space temperature is below setpoint. Gas heat shall modulate to maintain space temperature.
    2. If space temperature is satisfied but outside air temperature is above setpoint, the system shall remain in heating mode and maintain a neutral supply air temperature (set at space heating setpoint).
  - J. Unoccupied Dehumidification
    1. When the space humidity sensor is above it's unoccupied setpoint (60% adj.) the unit shall energize and go into its dehumidification mode.
    2. Recirculation damper shall open and the outside air damper shall remain closed.
    3. Hot gas reheat shall modulate to maintain neutral supply air temperature.

END OF SECTION 230993.8

## SECTION 230993.9 - SEQUENCE OF OPERATION (VARIOUS SYSTEMS)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230993 - Sequence of Operations for HVAC Controls and Points List

### PART 2 - SEQUENCE OF OPERATION

#### 2.1 GAS DETECTION SENSOR:

- A. When CO or NO2 levels rise above the low level setpoint, ventilation system shall activate if the ventilation system is not already running. An alarm shall be sent to the building automation system.
- B. When carbon monoxide rises above high level setpoint, alarm shall sound and indicator light shall energize. An alarm shall be sent to the building automation system.
- C. System shall be manually reset after carbon monoxide levels drop below low setpoint.

#### 2.2 FLOAT SWITCHES:

- A. When float switch rises to preset water depth, the system shall be de-energized.
- B. When float switch drops to below preset water depth, the system shall automatically restart.

#### 2.3 PHASE LOSS PROTECTION AND LOW VOLTAGE PROTECTION:

- A. Systems protected with phase loss protection and low voltage protection shall be re-energized after the electrical power is restored.

END OF SECTION 230993.9

## SECTION 232113 - HVAC PIPING (GENERAL)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pipe, pipe fittings, accessories and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230517 - Sleeves, Seals, and Escutcheons
  2. Section 230523.03 - Gas Valves for HVAC Systems
  3. Section 230529 - Hangers and Supports for HVAC Piping
  4. Section 230548 – Sound, Vibration, and Seismic Control for HVAC

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All pipe and pipe fittings shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:
  - a. Non-Ferrous Metallic Pipe and Fittings:
    - 1) Copper Tube, Water, Seamless, Types K, L, and M. ASTM B88
    - 2) Pipe Fittings, Brass or Bronze, 125 and 250 lbs., Cast or Wrought. ANSI B16.15
    - 3) Solder Joint Fittings, Pressure, Copper Alloy. ANSI B16.22
    - 4) Refrigerant Piping. ANSI B31.5, ANSI B36.40, ASTM A333
    - 5) Copper tube (drain, vent) DWV. ASTM B306
    - 6) Copper tube (refrigeration), ACR. ASTM B280

b. Pipe Joining Materials, Gaskets, Methods, and Accessories:

1) Soldering and brazing ANSI B9.1

**B. Material shall be new domestic materials (made in the USA) of standard manufacture suitable for specified use.**

C. Manufacturer shall certify materials conform to reference specifications, or specification number shall be cast into or marked on each piece.

D. Manufacturers:

1. The following solder manufacturers are acceptable:

a. United Wire

b. Engelhard

c. Elkhart

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. No materials shall be co-mingled within the same system except those which are specifically approved in these specifications.

### 2.2 PIPE SCHEDULE:

A. Cooling Coil Condensate Drain Piping:

1. Indoor piping shall be seamless hard drawn, Type L, copper pipe.

2. Outdoor piping shall be schedule 40 PVC.

B. Refrigerant Piping:

1. Piping shall be seamless hard drawn, Type L, copper pipe. Piping below ground shall be Type K. Copper tubing with O.D. of 1/4" and 3/8" shall have minimum nominal wall thicknesses of .030" and .032" respectively.

2. Piping up to 5/8" can be seamless soft drawn, Type L, copper pipe, ASTM BS280, where permitted by the equipment manufacturer.

3. Piping shall be dehydrated, charged with nitrogen, and capped.

### 2.3 FITTINGS AND CONNECTIONS:

A. Fittings shall be the same material and weight as the pipes joined by the fitting unless noted otherwise. Fittings shall comply with all applicable standards.

- B. Copper Pipe Fittings - Refrigerant Service:
  - 1. Fittings shall be wrought copper.
  - 2. Solder used in fittings shall be a 45% silver alloy. Phosphorous alloys are not acceptable.
  - 3. All joints shall be brazed.

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. Pipe shall be installed in strict accordance with manufacturer's recommendations.
- B. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all window, doors, and other openings or obstructions. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs.
- C. Each length of pipe, as erected, shall be upended and rapped. Dirt and all foreign matter shall be cleaned from pipe and fittings before installation.
- D. All turns and connections shall be made with long radius fittings as specified hereinafter.

#### 3.2 PIPING TO EQUIPMENT:

- A. All piping connections to coils, equipment, valves and other system components shall be made with offsets with flanges or unions so arranged that the equipment can be serviced or removed without dismantling the piping.
- B. Provide all final pipe connections to systems and equipment.

#### 3.3 REFRIGERANT PIPE:

- A. Cut refrigerant pipe with wheel cutter only. Do not saw or ream.

#### 3.4 CONCEALED PIPE:

- A. Test all pipe prior to concealing or insulating.

#### 3.5 SITE UTILITIES:

- A. Provide all site surveys, excavation, and other investigative work to determine the exact location and invert of site utilities if utilities are in place prior to construction beginning. The Contractor shall perform this work prior to installation of any affected piping systems.



3.6 PIPE INSPECTION:

- A. The Owner and A/E reserve the right to inspect, sample, and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage, or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

3.7 DRAINAGE PIPING:

- A. Provide cleanouts at all changes of direction totaling 90 degrees or more.

END OF SECTION 232113

## SECTION 233112 - MECHANICAL DUCT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of mechanical duct, accessories, and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230520 - Meters and Gauges for HVAC Duct System
  2. Section 230548 – Sound, Vibration, and Seismic Control for HVAC
  3. Section 233113.1 - Metal Duct
  4. Section 233300 - Duct Accessories
  5. Section 233313 - Dampers
  6. Section 233346 - Flexible Duct

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. Mechanical duct systems shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:
  - a. SMACNA, Balancing and Adjustment of Air Distribution
  - b. SMACNA, High Velocity Duct Construction Standards
  - c. SMACNA, Low Pressure Duct Construction Standards
  - d. SMACNA, Fire Damper and Heat Stop Guide
  - e. SMACNA, Ducted Electric Heat Guide
  - f. SMACNA, Duct Cleanliness for New Construction Guidelines

- g. SMACNA, HVAC Duct Construction Standards
  - h. NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems
  - i. ASHRAE Handbook of Fundamentals and ASHRAE Systems and Equipment Handbook
  - j. International Building Codes
- 2. Duct shall be Class O in accordance with UL Standard 181. Where permitted by Code, Class 1 duct shall be allowed.
  - 3. All duct system components including insulations, adhesives, mastics, cements, tapes, coverings, connectors and appurtenances shall have a maximum UL flame spread of 25 and a smoke development rating of 50 as tested by ASTM E-84.
  - 4. Duct sealants shall meet UL 181A and UL 181B.
- B. Manufacturers:
- 1. The following duct sealant manufacturers are acceptable:
    - a. AirSeal McGill
    - b. Ductmate
    - c. Hardcast

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Dimensions shown on the plan are finished inside dimensions. The sizes of internally lined ducts shall be increased accordingly. The size of dampers, security bars and accessories shall also be increased in size.
- B. Ducts shall be smooth on inside.
- C. The general location of ducts shall be as shown on the contract drawings. Exact location of ductwork shall be determined by the Contractor.

### 2.2 SEALING DUCTS:

- A. General:
  - 1. Sealants shall be water based. Solvent based sealants are not acceptable.
  - 2. Sealants shall be UV, water and mildew resistant.
  - 3. Sealants shall be suitable for low, medium and high pressure applications up to 15" WG.

4. Sealants shall have a mild odor, no flashpoint, and not require a respirator for application.
  - B. All ducts shall be sealed in accordance with Seal Class A. Seal all joints (longitudinal and traverse) and all penetrations. Spiral lockseams do not require sealing.
  - C. Basis of design sealant (not exposed to weather) shall be:
    1. McGill AirSeal United Duct Sealer (Water Based).
  - D. Basis of design sealant (exposed to weather) shall be:
    1. McGill AirSeal Uni-Weather.
- 2.3 DUCT SHIPMENT:
- A. Intermediate Level (SMACNA):
    1. Ducts leaving the place of fabrication shall be kept clean and dry.

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. Contractor shall provide additional bends and offsets as may be required to bring ductwork into proper relation with other equipment and features of the building.
- B. Where changes are made in shape of ducts, full area shall be maintained and changes shall be gradual to minimize pressure drop.
- C. Ducts terminating at grilles and registers shall be provided with suitable means of attachment.
- D. All ductwork shall operate without chatter and vibration, and shall be free from pulsation.
- E. The following work shall be performed under direction of the System Test and Balance Contractor.
  1. Install all automatic dampers.
  2. Provide necessary blank-off plates (safing) required to install dampers that are smaller than duct size.
  3. Assemble multiple section dampers with required number of shafts through duct for external mounting of damper motors.
  4. Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation and affix and seal permanently in place after stratification problem has been eliminated.
  5. Provide access doors to adjust, maintain, or service equipment sensors, controllers and all other devices.

3.2 DUCT STORAGE:

- A. Duct shall be protected by storing on elevated supports.
- B. All ducts shall have ends capped during storage.
- C. The area used for storage shall be kept dry and clean.

3.3 PROTECTION AND CLEANING DURING INSTALLATION:

- A. During construction, all open ends of duct installed shall be capped.
- B. Prior to capping, all interior duct surfaces shall be wiped clean.

3.4 HANGING:

- A. Hanging and support systems shall be in accordance with SMACNA Duct Construction Standards and drawing details.
- B. Vertical ducts shall be supported by extending bracing angles to rest firmly on floors or shall be bolted to walls, columns or other construction.
- C. Where duct is supported by threaded rods, see Mechanical Sound, Vibration, and Seismic Control specifications for threaded rod requirements and attachment requirements.
- D. Where duct is supported by sheetmetal straps, the strap shall attach to the duct with two #10 sheetmetal screws located within 2 inches of the top of the duct.

3.5 ACCESSORIES:

- A. Doors, coils, dampers, registers, grilles, diffusers, air turning vanes, air volume extractors, and other accessory items shall be installed as detailed in the SMACNA Duct Construction Standard with adequate reinforcement and support to accommodate additional weight without damage to the duct.

3.6 COMPLETION AND DEMONSTRATION:

- A. Upon completion of the duct system installation, and before the A/E has inspected the system operation, open all system dampers and turn on fans to blow all scraps and other loose material out of the duct system. Allow for a means of removal of such material.
- B. Check the duct system to ensure there are no air leaks through joints, at reinforcement locations, seams, points of connection with fire dampers, coils, or other duct accessories. Any leaks shall be sealed with duct sealant.

END OF SECTION 233112

## SECTION 233113.1 - METAL DUCT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of all metal duct where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 233112 - Mechanical Duct

#### 1.3 QUALITY ASSURANCE:

- A. Codes and Standards: All work shall meet or exceed the standards and procedures (latest editions) of the following:
  1. ASTM A527 Galvanized Steel Spiral Lock Seam Duct
  2. Underwriter Laboratories, UL 103
  3. ANSI Z223.1
  4. NFPA 96
- B. Material shall be free from blisters or other mechanical defects. Material shall be galvanized prime sheet steel unless noted otherwise.
- C. Sheet metal thickness, cross joints, seams, slip-connections, cross-breaking, bracings, duct supports and reinforcing shall be in accordance with the more stringent requirements of ASHRAE Guide and SMACNA Duct Construction Manual for system pressure classifications. Minimum gauge thickness is 26 unless thicker gauges are indicated.
- D. Manufacturers:
  1. The following round duct manufacturers are acceptable:
    - a. United McGill
    - b. Semco
    - c. Turnkey Duct Systems

- d. Eastern Sheet Metal
- e. Lindab
- f. Hamlin
- g. BHV Sheet Metal Fabricators
- h. Spiral Pipe of Texas
- i. Patton Industries

## PART 2 - PRODUCTS

### 2.1 GENERAL:

#### A. Materials:

- 1. Duct shall be galvanized or as indicated elsewhere on the plans or in these specifications.
- 2. Plenums, collars, flashing, etc. located on roofs, exterior of the building, or other locations where exposed to the weather shall be stainless steel.

#### B. Closure:

- 1. Transverse joints and seams in sheet metal duct shall be of the types and sizes recommended by SMACNA and the ASHRAE Handbook for the specific duct pressure classification.

### 2.2 ROUND DUCT (SINGLE WALL SUPPLY):

#### A. Duct:

- 1. Duct shall be constructed with spiral lockseams or spiral lock seam/standing rib.

#### B. Fittings:

- 1. All fittings are to have continuous welds along all seams. All divided flow fittings are to be manufactured as separate fittings, not as saddle taps, tap collars, or similar duct components.
- 2. All 90 degree tees and 45 degree laterals (wyes) up to and including 12 inch diameter size shall have a conical entrance into the fitting, produced by machine or press forming. The entrance shall be free of weld build-up, burrs, or irregularities.
- 3. Elbows in diameters 3 inches through 12 inches shall be two section stamped elbows. All other elbows shall be gored construction with all seams continuous welded. Elbows shall be fabricated to a center-line radius of 1.5 times the cross-section diameter.

4. Pipe to pipe joints in diameters to 50 inches are by the use of sleeve couplings, reinforced by rolled beads.
5. Pipe-to-fitting joints in diameters to 50 inches are by slip fit of projecting collar of the fitting into the pipe. Insertion length of sleeve coupling and fitting collar is 2 inches for diameters through 9 inches and 4 inches for diameters 10 inches and up.

2.3 RECTANGULAR DUCT (DUAL WALL):

A. Duct:

1. Dual wall shall be:
  - a. Outdoor supply: 3"
  - b. Outdoor return: 3"

B. Materials:

1. Outer wall stainless steel (outdoor)
2. Inner wall galvanized

C. Fittings:

1. Fittings shall be constructed similar to fittings specified for single wall duct except that they shall be dual wall.

D. Liner:

1. Fittings shall have solid liner.
2. Dual wall duct shall have solid liner.

E. Insulation:

1. Insulation shall be .27K @ 75 degrees F.
2. Insulation shall be thickness of the dual wall.

F. Location:

1. Dual wall duct shall be provided in the following locations:
  - a. As indicated on plans.
  - b. Exterior ductwork for DHS-1



2.4 VEHICLE EXHAUST DUCT:

- A. Duct:
  - 1. Exhaust duct shall be constructed of:
    - a. 16 gauge stainless steel
  - 2. All duct shall be welded.
- B. Stainless Steel:
  - 1. All stainless steel shall be type 302 or 304 with a minimum of 18% chromium and 8% nickel content.

2.5 LOW PRESSURE RUNOUTS (ROUND):

- A. Where concealed round low pressure runout ducts are indicated, they may be snap-lock ducts in lieu of spiral duct unless another type of duct is specifically indicated.
- B. Duct shall be 26 gauge minimum.

PART 3 - EXECUTION

3.1 ROUND DUCT:

- A. Submittals shall include:
  - 1. Duct gauges and general construction
  - 2. Fitting gauges and general construction
  - 3. Liner gauges and general construction
  - 4. Friction loss
  - 5. Sound attenuation of straight duct sections
  - 6. Thermal conductivity factors defining the insulation characteristics

3.2 EXPOSED DUCT:

- A. Prepare exposed duct as recommended by the paint manufacturer for field painting in the following locations:
  - 1. Auto Repair and Auto Body Shops.

3.3 PLENUMS:

- A. Fabricate plenums connecting to louvers only after review of acceptable louver shop drawings.
- B. Fabricate plenums connecting to equipment only after review of acceptable equipment shop drawings.

- C. All plenum dimensions shall be based upon factory dimensions.

3.4 DUCT DRAWINGS:

- A. Provide 1/4" scale CADD drawings indicating layout of all.

3.5 WELDED DUCTS:

- A. All joints shall be electro welded by the heliarc process unless noted otherwise.
- B. Joints shall be free from cracks and shall be smooth and flush without the use of solder or other types of filler.
- C. All exterior welds shall be ground and polished without burrs and projections. Where exposed, weld to have a number 4 commercial finish.
- D. Interior joints of prechloric acid or radioisotope hoods shall be ground smooth similar to exterior duct weld. Weld shall not have pits.
- E. Provide submittal including all materials, welding equipment and supplies, and welder qualifications.

3.6 SUBMITTALS:

- A. Provide a list of all duct materials and systems in which they are to be installed for the entire project.

3.7 CUTTING DUCTS:

- A. Ducts shall be cut with a hand held plasma cutter whenever practical. This shall include, but not be limited to, cutting openings for access doors, duct taps, cutting into existing ducts, and similar applications.

END OF SECTION 233113.1

## SECTION 233113.5 - FABRIC DUCT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of all fabric duct where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 233112 - Mechanical Duct

#### 1.3 QUALITY ASSURANCE:

##### A. Manufacturers:

1. The following fabric duct manufacturers are acceptable:
  - a. Duct Sox
  - b. Fabric Air
  - c. Prihoda

### PART 2 – PRODUCTS:

#### 2.1 FABRIC DUCT:

##### A. General:

1. Duct shall be classified by Underwriter's Laboratories in accordance with the 25/50 Flame spread/smoke developed requirements.
2. Duct material shall be machine washable and designed for use from 0 degrees F to 180 degrees F.
3. Minimum weight of 6.8 oz/yd<sup>2</sup> per ASTM D3776.

B. Fabrication:

1. Air dispersion shall be by linear vents and permeable fabric. Linear vents shall include open orifices. Mesh style vents are not acceptable.
2. Duct system shall produce air film at outer wall of duct that prevents condensation.
3. Size and location of air dispersion shall be designed by manufacturer.
4. Connection to metal duct shall be by draw band and anchor patches. Inlet connection shall include a zipper for duct removal.
5. System shall include adjustable flow devices to balance airflow.
6. Provide end cap with zipper.
7. Connections to or offsets from straight runs shall be gored elbows or energy efficient tees. Elbows shall have a 1.5D radius.

C. Suspension Systems (Hoop):

1. System shall consist of a 360-degree hoop system, spaced 5' on center..
2. Powder coated aluminum hangers connect to an aluminum track every 3 ft. oc and to the fabric at the 10 and 2 o'clock locations with D-clasps (detachable).
3. The fabric system shall have intermediate track supports at 12 o'clock.
4. Hardware shall be provided by the fabric duct manufacturers and shall include the track, connectors, endcaps, and vertical cable kits. Radius track shall be provided for all radius sections.

D. Suspension System (Cable):

1. A suspension cabling system shall support the fabric duct.
2. All accessories to support the duct shall be provided by the duct manufacturer including but not limited to stainless steel cable, eye bolts, thimbles, cable clamps, and turnbuckles. All hardware shall be type 316 stainless steel.

E. Fabric Duct Color:

1. Color shall be standard color picked by the owner/architect.

F. Basis of design manufacturers shall be:

1. Duct Sox Sedona - Xm

PART 3 – EXECUTION:

3.1 SUBMITTAL:

- A. Include all materials, duct, fittings, supports, and accessories.
- B. Provide a 1/8" scale min. drawing of duct layout based upon review of all construction documents and field measurements of existing conditions.
- C. Submittal shall include airflow performance (horizontal and vertical) at 100 FPM, 75 FPM, and 50 FPM.

END OF SECTION 233113.5

## SECTION 233300 - DUCT ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor and materials, and perform all installation of duct accessories and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 233112 - Mechanical Duct

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. Duct accessories shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:
  - a. UL Standard 214 for Fire Retardancy
  - b. NFPA 90A and 90B
  - c. ASTM E477 Standard for Testing Prefabricated Silencers for Acoustical and Air Flow Performance
  - d. SMACNA
  - e. ASTM E84
  - f. AMCA Standard 500
2. Duct accessories shall have AMCA Certified Rating Seal when specified.

##### B. Manufacturers:

1. The following access door (low pressure) manufacturers are acceptable:
  - a. Ruskin
  - b. Air Balance

- c. KEES
- d. National Controlled Air
2. The following flexible duct connector manufacturers are acceptable:
  - a. Ventfabrics
  - b. Ductmate
3. The following test cap manufacturers are acceptable:
  - a. Ventlok
4. The following strap hanger clamp manufacturers are acceptable (for use where seismic restraints are not required):
  - a. Caddy

## PART 2 - PRODUCTS

### 2.1 FLEXIBLE CONNECTORS:

#### A. General:

1. Flexible connectors shall consist of two strips of 24 gauge metal and a coated fabric.
2. Metal strips shall be 2-3/4" minimum and fabric shall be 5" minimum.
3. Connectors shall be unaffected by mildew, resistant to weather and have a fire retardant coating on a noncombustible fabric.
4. Connector shall be suitable for -40 degree F to 180 degree F.
5. Where duct has roll formed mating flange, metal strips shall be roll formed.

#### B. Indoor Applications:

1. Characteristics:
  - a. Fabric: woven nylon
  - b. Weight: 22 oz/sq. yd.
  - c. Tongue Tear: 150/150 lbs.
  - d. Tensile Strength: 500/400 lbs.
2. Metal strips shall be galvanized or aluminum.
3. Manufacturer shall be:

a. DuctMate Proflex Vinyl Super Duty

C. Locations:

1. Inlet and outlet of each duct at all equipment with a fan.
2. See Spec Section 23 3714 Air Distribution Specialties for connections to VEX fans.
3. Other locations where indicated.

2.2 DUCT ACCESS DOORS (LOW PRESSURE):

- A. Low pressure access doors shall be provided in duct systems with static pressures up to 2 inches W.G. and for velocities up to 2400 FPM.
- B. Frame and door shall be 20 gauge galvanized steel in galvanized duct (and stainless steel in stainless duct). Door shall be dual wall with 1/2" insulation minimum.
- C. Door shall be removable cam type with two cams for doors less than 16" and four cams for door 16" and larger.
- D. Polyurethane foam seals shall be provided between frame and duct and between door and frame.
- E. Access doors shall be the following sizes:

<u>Duct Maximum Dimensions</u>	<u>Access Door</u>
6"	6" x 6"
14"	10" x 14"
18"	14" x 14"
Larger than 18"	16" x 16"

Multiple doors shall be provided in all ducts larger than 48".

2.3 AIRFLOW TEST CAPS:

- A. Provide 304L stainless steel test ports and cap on each main fume exhaust duct and each runout to a fume hood, equipment or grille in the fume exhaust system where airflow cannot easily or accurately be measured at the equipment or device.

2.4 STRAP HANGER CLAMPS:

- A. This product is acceptable only where seismic restraints of duct are not required.
- B. Duct straps shall be attached to steel beam, joist structure, or purlins by means of a manufactured product.
- C. Clamps shall be:
  1. CADDY Strap Hanger Clamps or similar



PART 3 - EXECUTION

3.1 DUCT ACCESS DOOR:

A. General:

1. Duct access door shall be provided for access to all duct mounted sensors, and other devices and appurtenances requiring periodic maintenance or inspections.

B. Duct Access Door:

1. Access door shall be attached to housing with sheet metal screws. Frame shall be sealed to duct with high pressure duct sealant.

3.2 FLEXIBLE DUCT CONNECTORS:

- A. Installed length of material shall be 50% flat length.

3.3 AIR FLOW TEST CAP:

- A. Coordinate with Test and Balance Agency the required location for each test port.
- B. If duct surface is not flat or test port is not available in the duct radius, weld a test port extension to the duct.

END OF SECTION 233300

## SECTION 230592 - SYSTEM START-UP

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the start-up of all building mechanical systems where shown on the drawings and specified hereinafter.

##### B. Description:

1. These systems shall include:
  - a. Air systems (heating, ventilating, air conditioning, exhaust and recirculation)

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230593 - Testing, Adjusting, and Balancing for HVAC

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and standards:

1. All work shall meet or exceed the standards and procedures of the following (latest edition):
  - a. AABC National Standards
  - b. SMACNA

##### B. Start-up of equipment shall be by manufacturer's representative unless noted otherwise.

##### C. Tests, in addition to those specified herein, required to prove code compliance, to meet insurance requirements, and to verify proper installation by the A/E, owner, or authorities having jurisdiction shall be provided by the Contractor.

##### D. All tests, instruments, and procedures shall be in accordance with the AABC National Standards and system test and balance specifications.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. All concealed work must remain uncovered until required tests have been completed. Sections of the system may be tested prior to concealing as outlined hereinafter.
- B. The Owner and the A/E shall be notified in writing a minimum of three working days prior to any tests being performed.
- C. Local, state and federal authorities having jurisdiction shall be notified in writing with sufficient time to schedule inspection as required by the authority.
- D. In no case shall a system be started or operated in such a manner that the system or component pressure or temperature ratings, or the pressure or temperature to which a system or component has been tested, be exceeded.

### 2.2 START-UP:

- A. Systems shall be started up by the Contractor except as required in specific portions of the mechanical specifications.
- B. The following systems shall be started up by a factory certified technician:
  - 1. Packaged heating and air conditioning equipment
  - 2. Large fans
  - 3. Vibration isolation
  - 4. Vehicle exhaust fan system
  - 5. Air handlers
  - 6. Ductless split system
- C. The following systems shall be started up by a factory technician:
  - 1. 100% Outside air equipment – factory technician

### 2.3 AIR DISTRIBUTION SYSTEMS:

- A. General:
  - 1. Cleaning and leakage testing are not required for existing duct systems unless indicated otherwise.
- B. Cleaning of Duct System:
  - 1. Upon completion of duct and before installation of any outlets, the contractor shall clean entire duct system of all rubbish, plaster, dirt, etc.

- C. Leakage Tests for systems 2 inch w.g. and less:
1. Verify, by use of air monitoring devices and pitot tube traverse, that the total air quantities measured at all outlets and the air quantity handled by the fan differ by no more than  $\pm 5\%$ .
  2. Where leakage is determined to exceed 5% in accordance with the above testing procedure, the Contractor shall locate and repair the duct to reduce the leakage to acceptable levels.
  3. Where excessive leakage is noted at any location, whether the entire system meets the 5% leakage rate or not, the Contractor shall repair the duct to minimize the leakage at the location identified.
  4. Leakage includes all connected components of the system.
  5. Leakage tests shall be repeated until the duct is proven to be within the limits of leakage specified herein.

#### 2.4 STARTING THE PIPING SYSTEMS:

- A. Prior to putting any piping system in service, it shall be tested and thoroughly cleaned according to the procedures as specified below and as required by the equipment manufacturer, whichever requirement is more stringent.
- B. The Contractors are responsible to take all precautions necessary to prevent contamination of existing domestic water and also to prevent unauthorized use, when connecting new systems to existing water lines.
- C. Dehydration of Refrigerant Piping Systems:
1. Dehydrate refrigerant piping systems using a vacuum pump with check valve.
  2. The systems shall be evacuated to 500 microns and held there for three hours.
  3. The vacuum shall be broken with dry refrigerant.
  4. After approved by the third party inspector, fill the system with its operating charge of refrigerant.
  5. Variable refrigerant systems shall be tested in accordance with manufacturer's requirements. System shall be evacuated to the level indicated in this specification or what is required by the manufacturer, whichever is most stringent.

#### 2.5 PIPING SYSTEM TESTS:

- A. General:
1. Upon completion of each system of work under this Division and at a designated time, all piping shall be pressure tested for leaks.

2. All piping located underground shall be tested before backfilling.
3. Sections of the system shall be tested prior to concealing the piping in walls, chases, false ceilings, etc.
4. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to Owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted.
5. All equipment not capable of withstanding the test pressure shall be valved off during test.
6. Provide all gauges, valves, caps and accessories to properly test system.
7. At no time shall a system be tested at a pressure greater than the piping system or component is rated.

B. Refrigerant Piping:

1. Refrigerant piping shall be tested in accordance with the equipment manufacturer's recommended pressure.
2. All joints and equipment shall be leak tested using a halide or electronic leak detector.
3. The test shall be for the length of time recommended by the manufacturer or thirty minutes, whichever is greater, without leakage.

C. Gas Piping:

1. Gas piping shall be tested in accordance with these specification, the current edition of the International Fuel Gas Code (IFGC), or the local authority have jurisdiction, whichever is greater. If the contractor does not have a copy of the section of the International Fuel Gas Code, Buford Goff & Associates will provide a copy upon request.
2. Piping shall be tested to 1 ½ times working pressure but not less than 5 PSIG.
3. Testing shall be performed before painting. If the piping is painted before testing, test pressure shall be 1 ½ times working pressure but not less than 90 PSIG.
4. Tests shall run for ½ hour for each 500 cu ft of pipe volume.
5. Pressure shall be measured with a manometer.
6. The test gas shall be air, nitrogen, carbon dioxide or an inert gas.
7. Connection between new and existing pipe shall be tested by an approved leak detection method.

8. Isolate appliances or plug lines as required by the IFGC.

D. Piping Systems with Mechanical Connections:

1. Piping shall be tested in accordance with manufacturer's requirements.

2.6 SYSTEM START-UP:

A. General:

1. System shall be started and checked to ensure safe and proper operation.
2. Minimum requirements are listed for each system and are in addition to manufacturer start-up requirements and the requirements stated in the specific sections of the specifications.
3. Temperature control systems installed complete and operable.
4. Proper thermal overload protection in place for electrical equipment.

B. Air Systems:

1. Verify proper fan rotation.
2. Verify full load amps are below nameplate amps.
3. Verify control dampers operating.
4. Verify balance dampers are open.
5. Remove all duct restrictions.
6. Verify clean filters are installed.
7. Verify access doors are closed and duct end caps are in place.
8. All outlets shall be installed and connected.

C. Vibration Isolation System:

1. Verify that all systems are free floating. Check for short circuits.
2. Check that hanger rods are not hitting hanger.
3. Determine if isolators are properly adjusted.
4. Check all bearings with stethoscope for excessive bearing noise.
5. Check alignment of flexible connections.
6. Check free length of duct connectors.

2.7 SYSTEM PRESSURES:

- A. Observe the start-up of systems to verify that no dangerous conditions exist as the result of high (supply) or low (return/exhaust) pressure. If excessive pressures are observed, report the observed condition and shut down or modify system operation to avoid damage.

PART 3- EXECUTION

3.1 SUBMITTALS:

- A. Submit to the A/E all test results including a minimum of the following information:
  - 1. System tested
  - 2. Location of test
  - 3. Date, time, and ambient temperature at test startup and completion
  - 4. Persons present for test
  - 5. Duration of test
  - 6. Test equipment
  - 7. Test results
- B. Partial system may be done at the Contractor's option except tests shall be completed:
  - 1. For each phase designated by contract documents
  - 2. In accordance with building contracts schedule for completion
  - 3. As required to turn over portions of the system for the Owner's use
- C. Reports shall include but not be limited to:
  - 1. Tests during construction
  - 2. Manufacturer's factory test reports
  - 3. Equipment start-up reports
- D. Reports shall be submitted within ten days of test completion.

3.2 ENGINEER REVIEW:

- A. The A/E shall, at his discretion, recheck any or all of the test work. Provide ample number of technicians and test equipment to perform the tests required.
- B. All systems not accepted shall be retested.

- C. Systems shall be retested and rechecked until accepted by all parties.

3.3 DUCT LEAKAGE:

- A. Where leakage is determined to exceed the allowable rate, locate and repair the duct to reduce the leakage to acceptable levels.

END OF SECTION 230592



## SECTION 233313 - DAMPERS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Furnish all labor, materials, and perform all operations in connection with the installation of dampers and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  - 1. Section 233112 - Mechanical Duct

#### 1.3 QUALITY ASSURANCE:

- A. Codes and Standards:
  - 1. Dampers and appurtenances shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:
    - a. UL Standard 555, 555S (smoke), and 555C (ceilings)
    - b. NFPA 90A
    - c. AMCA Standard 500
    - d. SMACNA Standards
- B. Manufacturers:
  - 1. The following balancing damper manufacturers are acceptable:
    - a. Ruskin
    - b. Air Balance, Inc.
    - c. Nailor-Hart
    - d. Louvers and Dampers, Inc.
    - e. NCA
    - f. Airline Products

- g. Arrow
  - h. Leader Industries
  - i. Pottorff
  - j. United Enertech
2. The following insulated outside air damper manufacturers are acceptable:
- a. Tamco
  - b. Greenheck
  - c. Ruskin
  - d. Pottorff

## PART 2 - PRODUCTS

### 2.1 BALANCING DAMPERS:

#### A. General:

- 1. Bolts, screws or rivets shall not be used in construction of damper assembly.
- 2. Damper shall be opposed blade for dampers 14 inches and higher.
- 3. Bearings shall be non-corrosive, non-stick type and shall be molded synthetic Cycloy 800, stainless steel, or Zytel.
- 4. Damper manufacturer shall provide a complete damper assembly including linkage for connection to actuator, mullions, and jack shafts.
- 5. Provide locking quadrant on all manual dampers.
- 6. All dampers with shafts extending through the ducts with exterior insulation shall have 2 inch standoff brackets or shaft extensions.

#### B. Materials:

- 1. Dampers material shall match the duct material in which it is installed unless noted or specified otherwise.

#### C. Manual Dampers:

- 1. Low Pressure (Rectangular):
  - a. Frame shall be 5" x 1" x 16 gage galvanized steel channel. Blades shall be 8" wide, maximum, 16 gage galvanized steel.

- b. Dampers 36" W x 12" H and smaller shall have a frame 3" x 22 gauge and 22 gauge blades.
- c. Manual balance dampers shall be:
  - 1) Ruskin MD15
- 2. Low Pressure (Round):
  - a. Frame shall be 20 gage galvanized steel, 7 inches in length, minimum. Blades shall be 20 gage.
  - b. Maximum velocity shall be 1500 FPM.
  - c. This damper shall not be required in flex runouts except where concealed regulators required.
  - d. Low pressure manual balancing damper (round) shall be:
    - 1) Ruskin MDRS25

## 2.2 INSULATED OUTSIDE AIR DAMPER:

### A. General:

- 1. The following dampers shall be insulated, low leakage type:
  - a. Dampers in outside air ducts.
  - b. Dampers in relief ducts connecting to a hood or louver relieving air to outdoors.
  - c. Exhaust air ducts where a motorized damper is indicated.
  - d. Locations where the damper can be in contact with ambient air.
- 2. Damper manufacturer shall provide a complete damper assembly including linkage for connection to actuator, mullions, and jack shafts.

### B. Construction:

- 1. Frame shall be 0.08" minimum extruded aluminum and 4" deep.
- 2. Blades shall be aluminum with insulated core. R value shall be 2.29 minimum.
- 3. Blade seals shall be EPDM.
- 4. Frame seals shall be extruded silicone.
- 5. Hardware shall be aluminum and corrosion resistant zinc plated steel.
- 6. Damper shall be opposed blade.

- C. Leakage Rate:
  - 1. Damper shall be AMCA certified for a maximum leakage at 1" WG of 3 CFM per sq. ft. damper area.
- D. Damper shall be:
  - 1. Tamco Series 9000

### PART 3 - EXECUTION

#### 3.1 BALANCE DAMPERS:

- A. General:
  - 1. Dampers shall be installed with blades horizontal unless shown otherwise on drawings. Manufacturer shall provide proper damper for installation in non-horizontal ducts.
  - 2. Dampers shall be installed square and without racking. Damper installations shall not allow twisting, torquing or distortion. Provide proper clearances for operation of damper blades.
- B. Installation:
  - 1. Multiple damper sections shall be braced at every horizontal mullion and braced 8 feet O.C., maximum, vertically.
  - 2. Join multiple damper assemblies or fasten damper to duct with Number 10 screws, or 1/2" long welds staggered on both sides 8" on center and maximum of 2" from damper corner or end of joining section. Screws shall not impede performance of glade of blade seals.
- C. System Start-Up:
  - 1. After testing and balancing has been performed, the Contractor shall provide five (5) additional balance dampers (maximum 400 square inches each) as required to meet design conditions.

END OF SECTION 233313

## SECTION 233346 - FLEXIBLE DUCT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of all flexible duct where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 233112 - Mechanical Duct

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All flexible duct shall comply with all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:
  - a. NFPA 90A and 90B
  - b. Air Diffusion Council test code FD72-R1
  - c. Underwriters Laboratories, Class 1, Air Duct Standard 181
2. Duct shall be suitable for temperatures up to 180 degrees F

##### B. Manufacturers:

1. The following flexible air duct manufacturers are acceptable:
  - a. Flex Master
  - b. Thermaflex
  - c. Anco

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Outer jacket shall be fiberglass scrim reinforced metallized film laminate.
- B. Insulation R value shall not be less than the duct insulation in the duct to which the flex duct is connected to, but in no case shall the R value be less than 6.0 BTU/hr. sq. ft/degrees F at 70°F. Duct in attics or other unconditioned spaces shall have a minimum R value of 8.0 BTU/hr. sq. ft/degrees F at 70°F.
- C. Vapor barrier permanence shall be .1 perm per ASTM Method E96.
- D. Inner liner shall be an encapsulated steel spring helix or mechanically fastened to the steel spring helix.

### 2.2 STANDARD GRADE DUCT (ACOUSTICAL):

- A. Inner liner shall be chlorinated polyethylene (CPE) or polyester.
- B. Duct shall be suitable for temperatures up to 250 degrees F (continuous), 4000 FPM, +6" W.G. for up to 16" duct and -1/2" W.G. for up to 16" duct.
- C. Duct shall be provided at:
  - 1. All flex duct locations except those where medium velocity flex duct specified or indicated on plans.
- D. Duct shall be (metallic jacket):
  - 1. Thermaflex M-KE

### 2.3 SUPPORTS:

- A. Hanger or support saddle shall be provided by the duct manufacturer.
- B. Support shall be of sufficient width to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger or saddle material.
- C. Factory installed suspension systems integral to the flexible duct are an acceptable alternative hanging method when manufacturers' recommended procedures are followed.

### 2.4 DUCT LENGTHS:

- A. The runout length to terminal units shall be:
  - 1. 24 inches maximum
- B. The runout length to air distribution units shall be:
  - 1. 5 feet maximum

2.5 CONNECTIONS:

- A. Tapes and mastics to seal flexible air ducts shall comply with UL 181B and shall be marked 181B-FX or 181B-M.

2.6 ACOUSTICAL PERFORMANCE:

- A. All standard grade flexible ducts shall have acoustical properties for ducts as follows:

- 1. The insertion loss (dB) of a 10 foot length of straight duct at 2500 FPM:

	<u>125 Hz</u>	<u>250 Hz</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>4000 Hz</u>
8 inch	11	32	35	38	41	24
12 inch	7	30	29	36	32	15

- 2. Other size ducts shall have construction equal to and acoustical properties similar to that shown for 8" and 12" duct.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Flexible duct shall be supported at manufacturer's recommended intervals but at no greater distance than five (5) feet. Maximum permissible sag is 1/2 inch per foot of spacing between supports.
- B. Hangers shall be adequately attached to the building structure.
- C. Take every precaution to avoid tearing of vapor barrier. Damage to vapor barrier may be repaired with approved tape. If internal core is penetrated, replace flexible duct.
- D. Terminal devices connected by flexible duct shall be supported independently of the flexible duct.
- E. No splicing of flexible duct shall be permitted. All runs must be continuous.
- F. Bends shall not be made with centerline radius less than one duct diameter.
- G. Do not install flexible duct adjacent to any equipment, piping, etc. which operates above the recommended flexible duct use temperature.
- H. Flexible duct shall not be installed through any partition.

3.2 ATTACHING FLEXIBLE DUCT:

- A. Collars to which flexible duct is attached shall be a minimum of 2 inches in length.
- B. Peel the vapor barrier back 3 or 4 inches. Fold the insulation back over the vapor barrier.
- C. Trim duct ends squarely.

- D. Tape duct to sleeve or collar.
- E. Replace insulation and vapor barrier. Tape to provide vapor seal and protect cover. Connect with locking strap. Strap shall be metal for systems above 2" W.G. and above gypsum, plaster, and other hard ceilings.
- F. Slide inner core of each flexible duct section over sheet metal sleeve one-half the length of sleeve.
- G. Protect flexible duct at connections to sleeves or collars by allowing duct to extend straight for a few inches beyond the end of the sheet metal connector before making a bend.

3.3 INSTALLATION INSPECTION:

- A. The contractor shall review all flex duct installed when the system is operating at maximum airflow to verify no significant duct leakage at any flexible duct connection.
- B. If any leakage is found, the connection shall be repaired.

3.4 INSTALLATION:

- A. Where practical, flex duct shall be installed a minimum of 6 feet downstream of air handling equipment.

END OF SECTION 233346



## SECTION 233400 - HVAC FANS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of fans and air handling equipment and appurtenances where shown on the drawing and specified hereinafter.

##### B. Description:

1. Fans (General Purpose) include low pressure equipment designed to handle relatively small amounts (less than several thousand CFM). This equipment is typically located on roof curbs, in walls or ceilings, or in small duct systems.
2. Fans (Air Handling) include equipment designed to handle relatively large amounts of air or at high pressures. This equipment is typically installed in equipment rooms, in built-up housings, or custom air handlers.

#### 1.2 RELATED DOCUMENTS:

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

- ##### B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 230502 - Common HVAC Materials
2. Section 230513 - Common Motor Requirements for HVAC Equipment
3. Section 230515 - Controllers, Starters and Electrical Work

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. AMCA 300 - Certified Ratings for Sound and Airflow
  - b. AMCA 210 - Test Code for Air Moving Devices
  - c. Insulation - NFPA 90A and UL 181
  - d. NFPA 96

- e. UL762 Outdoor - Power Ventilation for Restaurant Exhaust Appliances.
  - f. UL705 (Single width backward inclined fans).
- B. Grease hood exhaust fans shall be UL listed.
- C. All fans used for smoke exhaust or smoke control applications shall be UL listed as Power Ventilators for Smoke Control.
- D. Manufacturers:
- 1. The following fan (general purpose) manufacturers are acceptable:
    - a. Greenheck
    - b. Cook
    - c. Penn Ventilator
    - d. Twin City Fans
  - 2. The following fan (air handling) manufacturers are acceptable:
    - a. Sheldons
    - b. Barry Blower
    - c. Trane
    - d. Flakt
    - e. Cook
    - f. Greenheck
    - g. Chicago Blower
    - h. Twin City Fans
    - i. New York Blower
  - 3. The following vehicle exhaust fan manufacturers are acceptable:
    - a. Nederman
    - b. Car-Mon
    - c. Tykron
    - d. AQC

## PART 2 - PRODUCTS

### 2.1 MOTORS:

- A. All motors are premium efficiency.
- B. Motors controlled by variable frequency drives shall be inverter duty rated.
- C. Where ECM motors are specified to be controlled by the building automation system. The ECM controller shall be controlled by a 0-10 VDC input (or any other input signal coordinated with the control contractor).
- D. Where ECM motors are specified strictly to manually balance the fan airflow, the motor shall be provided with a manual speed controller.

### 2.2 FANS (GENERAL PURPOSE):

#### A. General:

- 1. All units shall be licensed to bear the AMCA Certified Ratings Seal for sound and air flow.
- 2. Fan wheel and shaft shall be statically and dynamically balanced by the fan manufacturer.
- 3. Fan RPM, tip speed, and motor horsepower shall not exceed that specified or shown on the drawings.
- 4. Exhaust fans shall be furnished with automatic backdraft dampers unless a motorized damper is indicated.
- 5. Supply fans shall be furnished with motorized dampers.
- 6. Conduit chase thru curb cap shall be provided on roof mounted equipment.
- 7. Fan shall not be selected at more than 85% of maximum pressure obtainable with that fan at the specified CFM.

#### B. Bearings:

- 1. Equip all fans with antifriction ball or spherical roller, self aligning, pillow block bearings.
- 2. Bearings shall be in a cast iron housing and shall be regreaseable.
- 3. Bearings shall have a minimum life (AFBMA-L50) of 200,000 hours operation at maximum cataloged operating conditions.

C. In-Line Fans:

1. The fan housing shall be constructed of heavy gauge formed steel, with removable panels for access to the entire drive assembly and wheel for cleaning, inspection, and service without dismantling the unit.
2. The motor on direct drive units shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing.
3. The motor on belt drive units shall be mounted on the exterior of the fan housing and shall be isolated from the airstream. Bearings shall be protected from the airstream by an enclosure.
4. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone.
5. Each fan shall be provided with support isolators.
6. The fan housing shall be internally lined with a fiberglass duct liner for noise reduction and condensation control. Belt-drive fans shall be provided with a beltguard of formed, welded and painted steel.
7. All fans mounted outdoors shall be provided with a motor cover, inlet hood, and birdscreen.
8. The following accessories shall be furnished and installed with the fan assembly:
9. Fan intake or exhaust guard fabricated of 1/2" x 1/2" galvanized wire on a galvanized frame for all fans not connected directly to ducts. Frame shall be removable.

D. Mixed Flow In-Line Fans:

1. Duct mounted supply, exhaust or return fans shall be of belt-driven mixed flow inline type. The fan housing shall be constructed of galvanized steel in a structurally rigid, formed octagonal design and shall include removable duct collars for slip-fit connection to ductwork as standard.
2. Fan construction shall include a universal mounting system allowing for mounting of the fan in hanging and base-mounted horizontal configurations. Housing shall be field rotatable to adjust the position of the motor. Fans shall also include an OSHA compliant galvanized steel belt guard that encloses the motor pulley and belts.
3. The fan wheel shall be a fully welded mixed flow wheel, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
4. Motors shall be heavy-duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the airstream, and motors shall be readily accessible for maintenance.

5. Precision ground and polished fan shafts shall be mounted in regreaseable pillow block ball bearings with extended lubrication lines to the exterior of the housing as standard. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours (L50 average life in excess of 500,000 hours) at maximum cataloged operating speed.
6. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for system balancing.
7. A NEMA-1 disconnect switch shall be provided as standard. Factory wiring shall be provided from the motor to the handy box.
8. Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.
9. Fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

### 2.3 FANS (AIR HANDLING):

#### A. General:

1. All units shall be licensed to bear the AMCA certified Ratings Seal for sound and airflow.
2. Fan RPM, tip speed, and motor brake horsepower shall not exceed that specified or shown on the drawings.
3. Fan wheels shall be designed for continuous operation at maximum rated fan speed and motor horsepower.

#### B. Bearings:

1. Equip all fans with extra heavy duty, grease lubricated, antifriction ball or spherical roller, self-aligning, pillow block bearings.
2. Select bearings for a minimum life (AFBMA-L10) of 200,000 hours operating at fan's maximum cataloged operating conditions.

#### C. Bases:

1. Provide all fans with structural steel bases isolated from the structure by vibration mountings as specified under the mechanical SOUND, VIBRATION AND SEISMIC CONTROL Specification.

#### D. Balancing:

1. Statically and dynamically balance all fans after surface treatment and prior to shipment.

- E. Shafts:
  - 1. Shafts shall be SAE 1040 ground and polished solid steel.
  - 2. Fan and shaft shall be selected to operate at least 25% below the first control speed.
- F. Screens and Guards:
  - 1. Inlet screens shall cover the entire fan inlet openings.
  - 2. Provide outlet guard.
- G. Lubrication Fittings:
  - 1. Extend lubrication lines with fittings on all fans and fan motors to accessible locations.
- H. Finish:
  - 1. Provide a powder coat finish unless a special finish is specified elsewhere.
- I. Belt Driven Fans:
  - 1. Fan Drives:
    - a. Units up to and including 30 HP shall be variable pitch and suitable for adjustment plus or minus twenty percent of specified RPM.
    - b. Provide fixed pitch sheaves for units greater than 30 HP.
    - c. Belt service factors to be 1.2 of motor nameplate horsepower for motors 10 horsepower and less, and 1.4 of motor nameplate horsepower for motors greater than 10 horsepower.
    - d. Provide stock type 3V, 5V, and 8V fixed pitch motor and companion fan sheaves for use with high strength narrow style V-belts. Type to be applicable for the particular requirements of each fan.
    - e. Furnish machine matched V-belts sets sealed with wire.
  - 2. Drive Guards:
    - a. Provide OSHA belt guard with technometer openings for fan and motor.
    - b. Include a permanent metal tag attached to each belt guard cover indicating number, style, and length of replacement belts required.

J. Plenum Fans:

1. General:

- a. Fan pedestal shall be welded to mounting plate with lifting lugs.
- b. Wheel shaft shall accommodate the unit wall thickness.
- c. Fan inlet shall be connected by casing by a flexible connector.

K. Centrifugal Fans:

1. General:

- a. Fan discharge shall be connected to casing by a flexible connection.

2. Fan Housing (Centrifugal):

- a. Housing shall be constructed of heavy gauge steel, rigidly built and braced, full height structural angle iron braces on sides.
- b. Continuously weld housings 12" and larger. Lifting clips shall be welded to housing.
- c. Provide flanged inlet and outlet for duct connections.

3. Access Panels:

- a. Provide bolted on access panels rolled to fit the curvature of scroll and of same gauge.
- b. Fit panels airtight with neoprene gaskets. Panels to be the largest size available from the manufacturer for fan size. Locate below the centerline of the fan to permit easy cleaning of lowest part of scroll.

4. Drains:

- a. Provide 3/4" plugged drain connection welded to the lowest point of fan scroll.

L. Fan Class:

1. Fan shall be Class II or class required for the maximum RPM the motor can produce at design static pressure, whichever is greater.

2.4 VEHICLE EXHAUST FANS

1. General

- a. Backward inclined, non-overloading type with single thickness blades.

2. Housing
  - a. Housing shall be constructed of heavy gauge steel, rigidly built and braced, full height structural angle iron braces on sides.
  - b. Continuously weld housings.
  - c. Provide flanged inlet and outlet for duct connections.
3. Motor
  - a. Industrial grade C-face type bolted to the fan housing
4. Coating
  - a. Heresite air-dry phenolic synthetic resinous coating

### PART 3 - EXECUTION

#### 3.1 FANS:

- A. Fans shall be controlled as shown on schedules and in the SEQUENCE OF OPERATIONS FOR HVAC CONTROLS specification.
- B. After testing and balancing has been performed, provide a second drive and set of belts as recommended by the Test and Balance Agency to meet design conditions.

#### 3.2 FANS (AIR HANDLING):

- A. Shop drawing submittals shall include sound ratings and fan curves on all fans. Submit data of 1st through 8th octave bands.
- B. Fans shall be tested and the results submitted to the A/E prior to shipment.
- C. Tests shall be performed with an IRD analyzer at the specified operating speed to ensure that vibration amplitude is less than 1.5 mils peak to peak.
- D. All variable speed fans shall be factory inverter balanced.

END OF SECTION 233400



## SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution equipment and appurtenances where shown on the drawing and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. AMCA 300 - Certified Ratings for Sound and Airflow.
  - b. AMCA 210 - Test Code for Air Moving Devices.
  - c. Insulation - NFPA 90A and UL 181.
  - d. NAAMM Metal Finishes Manual.

##### B. Manufacturers:

1. The following air distribution manufacturers are acceptable:
  - a. Krueger
  - b. Metal Aire
  - c. J and J Register
  - d. Titus
  - e. Carnes
  - f. Tuttle and Bailey
  - g. E.H. Price

h. Nailor

PART 2 - PRODUCTS

2.1 AIR DISTRIBUTION UNITS (GENERAL):

A. General:

1. Furnish and install where shown on the plans, air distribution units in accordance with the air distribution schedules on the drawings and as specified hereinafter.
2. Perforated grilles shall have blades located in the neck of the unit. Blades shall have adjustable 2, 3, or 4 way ceiling pattern, with high anti-smudge characteristics and center aspiration.
3. Return air and exhaust air units in same space with supply shall match supply in style and type.
4. All supply, return, and exhaust air units shall be provided with opposed blade volume damper. Where return grilles are not ducted, the damper may be omitted.
5. Provide round to square adapter for flex duct connecting to square neck.
6. All supply air distribution units not installed in return air stream shall have factory installed insulation with FSK vapor barrier on all surfaces above conditioned space. Insulation shall be 1-1/2" minimum and all edges sealed with duct tape to the grille.

B. Material:

1. General purpose use: steel or aluminum unless other material indicated
2. Shower areas, drying areas, lockers, janitor rooms, group toilets, kitchens, mechanical spaces, utility spaces, and similar spaces subject to high humidity: aluminum.
3. Special applications as noted or indicated on schedules.

C. Finish:

1. All air distribution units shall be furnished with manufacturer's standard off-white baked enamel finish unless specifically noted otherwise on plans or in specifications.
2. Finish on bar grilles shall be (anodized aluminum) (dark bronze) (white) unless specifically noted otherwise on plans or in specifications.

D. Frame Style:

1. Frame style shall be suitable for surface in which air distribution unit is to be installed. Manufacturers or contractor shall provide all accessories such as plaster rings, etc., as necessary for a complete, finished installation.
2. Air distribution units shall typically be supplied with frame style as follows:
  - a. Units installed in sheetrock, plaster, or other hard finish shall have surface mounted frame style or plaster rings.
  - b. Units installed in acoustical ceilings shall have frame style to match ceiling system type.

2.2 ACOUSTICAL CEILING UNITS LOUVERED FACE:

- A. Acoustical ceiling air distribution units shall have (perforated face) (louvered face) with frame style compatible with ceiling type. Throw shall be 4 way unless other throws indicated.
- B. Surface mounted units shall have a panel face equal or less than the duct connection dimension plus 7".
- C. Lay-in ceiling units shall be nominal 24" x 24" unless specified otherwise.
- D. Faceplate shall be removable from the frame with concealed hinges and latches.

2.3 HARD OR MONOLITHIC CEILING UNITS LOUVERED FACE:

- A. Hard or monolithic ceiling air distribution units shall have (perforated face) (louvered face) as scheduled with surface mount frame style. Throw shall be 4 way unless other throws indicated.
- B. Surface mounted units shall have maximum dimensions as follows:
  1. Space required for installation - maximum of duct connection dimension plus 4".
  2. Panel face - maximum of duct connection dimension plus 7".
- C. Faceplates shall be removable from frame with concealed hinges and latches.

2.4 HEAVY DUTY GRILLE

- A. 14 gauge steel border with smooth contours and steel blades with 45 degree deflection, 3/4" on center blade spacing.
- B. Front blades shall be horizontal.
- C. Grille shall have a custom finish to match the architect's color sample.
- D. Grille basis of design shall be:

1. Price Model 96

## 2.5 PERFORATED FILTER RETURN GRILLE

- A. Grille shall consist of a perforated core with 3/16" holes on 1/4" centers staggered 60 degrees and an extruded aluminum boarder.
- B. The core construction shall be Aluminum.
- C. The grille shall feature a filter mounting frame that is capable of accepting a one or two inch filter. The filter frame shall be mounted with a hinge-tab mechanism to allow hinging or removal of the grille from the filter frame.
- D. Grille basis of design shall be:

1. Price Model 10AFF

## PART 3 - EXECUTION

### 3.1 AIR DISTRIBUTION UNIT:

- A. Adjust operable deflection vanes to 30 degrees.
- B. All plenums and duct visible thru face of air distribution units and bar grilles shall be painted flat black.
- C. See DAMPERS specifications for additional requirements.
- D. Add mastic to duct tape on insulated grilles.

END OF SECTION 233713

## SECTION 233714 - AIR DISTRIBUTION SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution specialties equipment and appurtenances where shown on the drawing and specified hereinafter.

##### B. Description:

1. The full extent of operating room and laboratory diffusers shall be coordinated with architectural reflected ceiling plan.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the Standards and procedures of the following as referenced (latest editions):
  - a. AMCA Certified Ratings for Sound and Airflow
  - b. AMCA 210 - Test Code for Air Moving Devices
  - c. Insulation - NFPA 90A and UL 181
  - d. ASHRAE 52 Test Standard for Filter Efficiencies
  - e. UL Standard 900 for Filter Flame and Smoke Rating
  - f. NAAMM Metal Finishes Manual

##### B. Manufacturers:

1. The following vehicle exhaust system (motorized reel type) manufacturers are acceptable:
  - a. Nederman
  - b. Tykron

- c. Carmon
- d. Ammerman
- e. AQC

## PART 2 - PRODUCTS

### 2.1 VEHICLE EXHAUST SYSTEMS (REEL TYPE):

#### A. Construction:

- 1. The mounting brackets and support frame shall be constructed of 11 gauge powder coated steel.
- 2. Hose guides shall be drum fitted.
- 3. The drum shall be 16 gauge powder coated steel.

#### B. Motorized Reel:

- 1. The reel shall include a single phase UL and CSA approved, totally enclosed 120V motor and chain drive mechanism. Motor and drum shall rotate at 14 rpm.

#### C. Accessories:

- 1. Provide all supports and accessories.
- 2. Fan bracket to mount fan directly on hose reel.
- 3. Hose to drum connection (6" to 8")
- 4. Up/down wall mounted switch.

### 2.2 VEHICLE EXHAUST SYSTEM HOSE AND ACCESSORIES:

#### A. General:

- 1. Hose and accessories shall be provided for type vehicle exhaust system specified unless specifically noted otherwise.

#### B. Exhaust Hose:

- 1. Hose shall be 44 feet in length and 6 inch diameter size based upon a maximum pressure drop of 2" WG (maximum).

#### C. Hose (High Temperature)

- 1. Hose shall be manufactured of two fabric plies with a galvanized steel helically wound wire imbedded between the plies.

2. The external ply shall be a high temperature fabric. The internal ply shall be of an E-glass base with silicone coating.
3. The hose shall be vulcanized.
4. The hose shall be suitable for ambient conditions down to -30 degrees F and suitable for continuous operating temperatures up to 800 degrees F.
5. The internal bore shall be smooth.
6. Basis of design:
  - a. Nederman NFC-4 high temperature hose

D. Accessories:

1. Accessories shall be provided for each fan provided.
2. Sizes shall be equal to exhaust hose size.
3. Tailpipe adapters:
  - a. Type 2: EPDM rubber with spring loaded compression grip and manual damper.
4. Diesel Stack Adapter:
  - a. Type 4: 22 gauge stainless steel with hook, manual damper, and slot for rain cap.
5. Special adapters:
  - a. Type 5: Special type adapters shall be fabricated specifically for the vehicle to be exhausted. Adapter shall include handle, damper, and accessories.
  - b. Type 6: Assembly for use with dual exhaust vehicles. The assembly includes EPDM dual fitting, two 5 ft. hoses, two exhaust adapters, and a SS tapered nozzle.
6. Stainless steel flanges and couplings shall be provided for connection of all accessories and connection of hose to duct.
7. Hose shall have special fittings that permit field connection of tailpipe and diesel stack adapters of the same diameter.
8. Fan inlet/discharge connections:
  - a. Neoprene coated fiberglass flexible connector
  - b. Transition from fan inlet/discharge to duct size indicated.

- E. Adapters required:
  - 1. The following systems shall have the type adapters indicated:
    - a. Provide tailpipe adapters for each hose reel.
    - b. Provide 1 (total) of each other type of adapter listed above.

PART 3 - EXECUTION

3.1 VEHICLE EXHAUST SYSTEM (REEL TYPE):

- A. Provide auxiliary steel and supports as required to mount hose reel.

END OF SECTION 233714



## SECTION 234100 - PARTICULATE AIR FILTRATION

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution equipment and appurtenances where shown on the drawing and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.
- B. All sections of Division 23 specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. AMCA 300 - Certified Ratings for Sound and Airflow
  - b. AMCA 210 - Test Code for Air Moving Devices
  - c. Insulation - NFPA 90A and UL 181
  - d. ASHRAE 52 Test Standard for filter efficiencies
  - e. UL Standard 900 for filter flame and smoke rating
  - f. Institute of Environmental Services Standard IES-RP-CC-DDI-86 for HEPA filters

##### B. Manufacturers:

1. The following filter manufacturers are acceptable:
  - a. Camfil Farr
  - b. American Air Filter
  - c. Airguard
  - d. Flanders Precisionaire

- e. Glasfloss
- f. Airflow, Inc.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Equipment with filters 4" or less in depth requires the following filters:
  - 1. First set shall be installed before initial start-up.
  - 2. Second set shall be installed for testing and balancing.
  - 3. Third set shall be turned over to the Owner at final inspection.
- B. Equipment with permanent filters requires the following filters:
  - 1. One set of throwaway filters shall be installed during construction.
  - 2. One set of permanent filters shall be installed at time of testing and balancing.

### 2.2 TWO INCH (2") PLEATED PANEL FILTERS:

- A. MERV 13 Filters:
  - 1. Panel filters shall be flat throwaway type constructed of high strength moisture resistant board forming a double wall around the filter media.
  - 2. A metal support grid is bonded to the leaving air side of the pleated media.
  - 3. The filters shall be UL Class 2 approved and listed.
  - 4. Filter shall have a maximum initial pressure drop of 0.13 inches WG at 250 FPM and 15 pleats per linear foot for 2 inch filters.
  - 5. Filter shall not have an electrostatically enhanced media.
  - 6. Filter media and frame shall be from 100% recyclable material.
  - 7. Basis of design filter shall be:
    - a. Camfil Farr AP-Thirteen

### 2.3 PERMANENT FILTERS:

- A. Thirty percent (30%) efficiency:
  - 1. Filters shall be aluminum.
  - 2. PTAC filters shall be plastic with a nylon media.

3. Filters shall be sized to fit housing.
4. Filters shall be washable.

#### 2.4 TEMPORARY FILTERS:

- A. During start-up, preliminary testing of system, operation of system prior to system being ready for testing and balancing, or operation of a system prior to final building cleaning, the contractor shall protect all equipment, coils, and the entire duct system with filters.
- B. Filters shall be MERV 8 minimum and contain an antimicrobial biocide to control the growth of mold, mildew, algae, and fungi on the filters (i.e., fibers shall not support microbial growth). Biocide shall not offgas, migrate, or leach into the airstream.
- C. Basis of design filter shall be:
  1. Fiberbond Dustlok

#### 2.5 EQUIPMENT REQUIREMENTS:

- A. Filters shall be provided on all equipment to protect heat transfer components from outside air, building exhaust air or other airstreams that would foul heat transfer surfaces.
- B. Where no other filtration is indicated or scheduled, air handling equipment shall have a 2" pleated panel filter. The 2" filter shall be MERV 11.

### PART 3 - EXECUTION

#### 3.1 TEMPORARY FILTERS:

- A. The contractor shall install temporary filter media on all negative pressure openings if the system is to be operated prior to the final cleaning of all spaces served by a system. These openings include open return ducts, exhaust ducts, and grilles. All filters shall be replaced as often as necessary.
- B. All temporary filters shall be held securely in place and with minimum bypass. Filters shall be changed as needed.
- C. Systems shall not be operated without filters equaled to specified filters in place to protect coils and other heat exchanger devices.

#### 3.2 SPARE FILTERS:

- A. The spare set of filters shall be (delivered to the Owner's warehouse facility within 25 miles of the project site) (stored at the project site at the location designated by the Owner).

END OF SECTION 234100

## SECTION 237800 - CENTRAL DEHUMIDIFICATION UNITS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical dehumidification units, accessories, and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All components shall comply with Codes and Standards of the specific section of these specifications.
2. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. AHRI Standards 210/240, 410, 430, and 440
  - b. Underwriters Laboratory
  - c. NFPA 90A
  - d. AMCA 210 Test Code for Air Moving Devices
  - e. National Electric Code
  - f. CGA/AGA Certification

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All heating and cooling equipment shall bear the ARI seal.

E. All refrigerant coils shall be ARI certified.

- F. All components to be provided with the mechanical dehumidification unit shall meet the requirements for that piece of equipment as specified. This includes performance characteristics and approved manufacturers.
- G. The manufacturer of the mechanical dehumidification unit shall have total responsibility for performance of the unit including all components within the unit.
- H. Units shall be UL listed and bear the UL label.
- I. Units shall bear the AMC Certified Rating Seal for air performance.
- J. Manufacturers:
  - 1. Subject to compliance with the project requirements, available manufacturers include, but are not limited to the following (see section 230501 for additional information):
    - a. Trane
    - b. Aeon
    - c. Greenheck
    - d. Daikin

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Equipment shall meet the following criteria:
  - 1. Meet the minimum requirements indicated for the dehumidification unit scheduled, including, but not limited to:
    - a. Full and part load capacities
    - b. Discharge air temperatures required
    - c. MCA and MOP
    - d. Efficiencies
  - 2. Units shall not exceed physical limitations, including size and weight.
  - 3. Comply with the sequence of operation indicated.
  - 4. Unit shall be controlled and monitored by the building automation system as indicated (i.e., in the sequence of operation).

2.2 MECHANICAL DEHUMIDIFICATION UNIT (GENERAL):

A. General:

1. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.
2. Furnish and install dehumidification units in accordance with the drawings and as specified hereinafter.
3. Unit shall be factory assembled and tested.
4. Standard operating range for cooling shall be 55°F to 120°F outdoor ambient except where low ambient controls are required.
5. Unless indicated otherwise, the entire dehumidification system shall be mounted on a single frame or skid.
6. Provide all controls and accessories for a complete operating system including but not limited to:
  - a. BACnet interface
  - b. Crankcase heater

B. Unit Casing:

1. Unit casing shall be 2-inch double wall and constructed of G-90 galvanized steel mounted on a structural base rail. Exterior surfaces shall be finished with a weather-resistant baked enamel finish.
2. Unit top shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed.
3. Unit walls, roof and floor shall be insulated. R value shall be 13 min All insulation edges shall be either captured or sealed.
4. All exterior bolts, nuts, washers, and sheet metal screws shall be stainless steel or zinc plated and shall be gasketed and sealed.

C. Access Doors:

1. Access doors shall be 18 gauge (min.) and similar in construction to unit exterior walls.
2. Access doors shall be gasketed with heavy duty stainless steel or corrosion resistant aluminum hinges that allow the doors to open 180 degrees.
3. Compression type handlers shall be operable from both the inside and outside of the unit.
4. Gasket shall be resilient neoprene bubble type.

D. Bearings:

1. Equip all fans with extra heavy duty, grease lubricated, antifriction ball or spherical roller, self-aligning, pillow block bearings.
2. Select bearings for a minimum life (AFBMA-L10) of 200,000 hours operating at fan's maximum cataloged operating conditions.

E. Fan and Motor:

1. Fan shall be non-overloading backward inclined fan, airfoil centrifugal plenum fan, or forward curved DWDI centrifugal fan with VFD.
2. Fan and motor shall be mounted on a structural isolation base.
3. Fan and motor shall be statically and dynamically balanced.
4. Provide seismic isolation.
5. Belt drives shall have a 1.4 (min.) service factor.
6. Fan shall have flexible duct connection on inlet and outlet.
7. Motors shall be high efficiency type with greaseable bearings on an adjustable sliding base.
8. Sheaves shall be adjustable.
9. Provide stainless steel shaft.
10. Motors shall have overload protection.

F. Drain Pan:

1. Drain pan shall be fully welded, sloped dual wall stainless steel, IAQ type.

G. Filter:

1. Provide adjustable flat filter rack for 2" or 4" filters.

H. Outdoor fans:

1. Fan motors shall be factory lubricated, inherently protected, and resiliently mounted.
2. Provide fan guard.
3. Fans shall be seismically isolated.
4. Direct drive motor.

5. Permanently lubricated, sealed ball bearings.
- I. Safeties:
1. Phase loss and low voltage safety cutoff.
- J. Electrical:
1. Single point electrical connection.
  2. Provide control voltage transformer.
  3. Provide transformer for motor or heaters as required.
  4. Transformers shall be factory mounted and wired.
  5. Control panel shall be fully gasketed.
  6. Electric panel shall be NEMA 4 and include a thermal magnetic, molded case, HACR circuit breaker, control power transformer, fan starters with three phase overload protection, control circuit fuses, fused condenser disconnect, and system controls.
- K. Dampers:
1. All dampers shall be of the low leakage type.
  2. Dampers shall be stainless steel.
  3. Nylon bearing with stainless steel bearing axles, straps, and control rods shall also be provided.
- L. Accessories:
1. Inlet hood with birdscreen
  2. Indirect gas furnace
  3. Motorized outside air damper
  4. Dx coil
  5. Motorized recirculation damper
  6. Supply air discharge temperature sensor
  7. Hailguard



## 2.3 GAS HEAT:

### A. General:

1. Furnace shall be integral component of packaged equipment.
2. The furnace shall be natural gas.

### B. Furnace:

1. The gas furnace shall be the indirect type and include a 409 stainless steel heat exchanger, die-formed burners of 409 stainless steel, and a stainless steel drip pan.
2. Furnaces shall be gravity vented unless power venting is indicated.
3. Minimum thermal efficiency shall be 80 percent unless a high efficiency is indicated.
4. Vent shall be raintight.

### C. Burner:

1. The burner assembly shall be complete with pilot and main gas pressure regulator, pilot and main manual shut-off valve, gas connections and controls.
2. Provide a gas regulator to reduce line pressure to burner pressure.
3. Burner shall be designed to operate:
  - a. Natural gas: 7" w.g. to 14" w.g.
4. The ignition system shall be:
  - a. Natural gas: direct spark ignition system.
5. Provide a burner air sheet for propane systems.
6. Minimum turndown ratio shall be 20:1.

## 2.4 DIRECT EXPANSION:

### A. Refrigerant Circuits:

1. Provide factory installed liquid line filter dryer and suction line accumulator.
2. Provide service valves/check valves, refrigerant line fittings, and service parts located for easy access.

3. Factory installed coil refrigerant metering device shall be mounted on unit liquid service valve. Metering device internal components shall be removable for cleaning or replacement.
4. Refrigerant circuit shall include service pressure tap ports, check valves, liquid line site glass, and refrigerant liquid line filter-drier.
5. The refrigerant circuit shall include head pressure control, accumulator, filter drier, high/low pressure safeties, loss of charge protections, gauge connections for high and low pressure, sight glass, and thermal expansion valve.

B. Compressors:

1. Compressors (Above 5 ton units):
  - a. Semi-hermetic compressor with crankcase heater, automatically reversible oil pump, internal protection devices including both thermal and current sensitive overload, high pressure stat, loss-of-charge pressure stat, off-cycle crankcase heater, and pressure relief device.
2. Compressor shall be seismically isolated.
3. The semi-hermetic compressor shall have isolation valves, oil pressure failure protection, and cylinder overloaders.
4. Compressors shall have hot gas bypass.

C. Coil Section:

1. Evaporator and condenser coils shall be aluminum fin, copper tube with 304 stainless steel casing.
2. Provide condenser coil guard.

D. Safeties:

1. Provide a time-guard device to prevent compressor recycling by requiring a 5-minute delay before restarting.

2.5 HOT GAS REHEAT:

A. Hot gas reheat coil:

1. Coil shall be aluminum fin, copper tube with stainless steel casing.
2. Hot gas reheat shall include head pressure control with liquid receiver, check valves, and inlet/outlet regulator valves.

B. Controls:

1. Provide full modulating control of hot gas reheat.

2. Reheat control shall maintain space setpoint to  $\pm 2$  degrees F.
3. Discharge air temperature shall be adjustable from the building automation control system.

2.6 SEACOAST CONSTRUCTION:

- A. Equipment specified to have seacoast construction shall meet the requirement of this section. Where additional coatings or special finishes are indicated, these shall be provided as well.
- B. Seacoast construction shall include, but not be limited to, the following:
  1. Coatings on all refrigerant components
  2. Stainless steel interior liner
  3. Stainless steel coil casing
  4. Stainless steel or non-rust hardware
  5. Stainless steel damper
  6. All coils shall have a flexible epoxy polymer e-coat uniformly applied to all coil surface areas with no material bridging between fins.
  7. Stainless steel wire screen air intake
- C. Coatings shall have no less than 5,000 salt spray resistance per ASTM B117-90. A minimum of 0.6-1.2 mills shall be applied to all surface areas including fin edges.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Mount grade mounted unit on housekeeping pad with 1/2" isolation pad.

3.2 CONTROLS:

- A. Install controls supplied for field mounting.
- B. Pipe condensate drain to drywell.

3.3 SUBMITTALS:

- A. Manufacturer's submittal shall include winter and summer design condition and part load conditions.
- B. Submittal shall include specific sequence of operation.

3.4 START-UP:

- A. Dehumidification unit manufacturers shall provide factory start-up of each system and trained technician for on site start-up of each system.
- B. Start-up shall include verification of proper sensor installation, electrical connections, controls and interlocks, required airflows and complete checkout of unit functions and safety features.
- C. Coordinate start-up schedule with owner.

END OF SECTION 237800

## SECTION 239005 - HEAT TRANSFER (ELECTRIC COOLING)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of heat transfer equipment and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230502 - Common HVAC Materials

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. ARI Standards 210/240, 340, and 360
  - b. ANSI Z21.47/UL - Unitary Air Conditioning Standard for Safety Requirements
  - c. Underwriter's Laboratory
  - d. NFPA 90A
  - e. AMCA 210 Test Code For Air Moving Devices
  - f. National Electric Code
  - g. ASHRAE 15 - Safety Code for Mechanical Refrigeration

- B. All motors and equipment shall be U.L. labeled.
- C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.
- D. All heating and cooling equipment shall bear the ARI seal.
- E. All coils shall be ARI certified.
- F. All electric heaters shall have impedance protection per UL519.

- G. Burner assembly, including the gas train, shall be FM and IRM approved.
- H. All outdoor cabinets shall meet or exceed the 500 hour salt spray test unless more stringent tests are specified.
- I. Manufacturers:
  - 1. The following ductless split and mini split system heating and cooling unit manufacturers are acceptable:
    - a. Mitsubishi
    - b. Daikin
    - c. Approved equal

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. General:
  - 1. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.
  - 2. Furnish and install heating and cooling units in accordance with the drawings and as specified hereinafter.
  - 3. Units shall be air conditioning or heat pump as shown on equipment schedules.
  - 4. Unit shall be factory assembled and tested.
  - 5. Standard operating range for cooling shall be 55°F to 120°F outdoor ambient except where low ambient controls are required.
  - 6. Provide all controls and accessories for a complete operating system including but not limited to:
    - a. Crank case heater
    - b. Start capacitor kit (single phase condensers)
  - 7. Refrigerant shall be R410A.
  - 8. Motors shall be premium efficiency.
- B. Outdoor Cabinets:
  - 1. Unit shall be designed for outdoor installation.

2. Cabinet shall be insulated and constructed of heavy duty galvanized steel. Frame and panels shall be 18 gauge minimum. They shall be zinc coated or epoxy coated with a baked-on finish.
  3. Prewired control panel.
- C. Refrigerant Circuits:
1. All units shall have factory installed liquid line filter dryer, liquid line sight glass, pressure tap ports, check valves, and suction and liquid service valves.
  2. Where low ambient control is required, electronic head pressure control shall be provided.
- D. Compressors (up to 7 tons):
1. Compressor shall have centrifugal oil pump.
  2. Motor shall have internal temperature and current sensing motor.
  3. Compressor shall have totally dipped hermetic motor windings.
  4. Compressor shall be resiliently mounted and seismically isolated.
- E. Compressors (7-1/2 tons to 30 tons):
1. Compressors shall have centrifugal oil pumps.
  2. Motor shall be suction gas-cooled with internal temperature and current sensing motor overloads.
  3. External high and low pressure cutout devices shall be provided.
  4. Compressor shall be resiliently mounted and seismically isolated.
  5. Minimum of two compressors for units larger than 120 MBH (nominal capacity).
- F. Outdoor Coil:
1. The outdoor coil shall be constructed of aluminum spine fin mechanical bonded to seamless aluminum or copper tubing with all joints brazed.
  2. Surface shall be engineered to facilitate defrost water runoff.
  3. Louvered panels.
- G. Indoor Coil:
1. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.

2. Coil shall include factory installed refrigerant metering device and refrigerant line fittings.

H. Outdoor Fans:

1. Fan motors shall be permanently lubricated, weatherproof motors suitable for outdoor use.
2. Motor shall have built-in current and thermal overload protection.
3. Fans shall be resiliently mounted and seismically isolated.
4. Fans shall be statically and dynamically balanced.
5. Provide PVC coated fan guard.

I. Indoor Fan:

1. Direct driven fans shall have ECM motor with internal overload protection.
2. Fan shall be seismically isolated.

J. Safeties

1. Heat pumps shall have a solid state defrost control. Defrost shall occur only when coil saturated suction temperature indicates freezing temperatures. Defrosting shall be limited to a maximum of 10 minutes over a 90 minute period.
2. Provide a time-guard device to prevent compressor recycling by requiring a 5-minute delay before restarting.
3. Three phase protection.

K. Electrical (Outdoor Unit):

1. Provide control voltage transformer.
2. Provide transformer for motor or heaters as required.
3. Transformers shall be factory mounted and wired.
4. Power to the unit shall be through the interior of the unit curb.
5. A thermal magnetic, molded case, HACR circuit breaker shall be provided. If the circuit breaker cannot be provided, the Contractor shall be responsible for field installation of a disconnect and acceptable overcurrent device and coordination with the electrical contractor. All costs shall be borne by the Contractor. If each component in the unit is protected from overcurrent, a non-fused disconnect is acceptable.



2.2 SPLIT SYSTEM UNITS (DUCTLESS AND MINI SPLIT):

A. Controls:

1. The system shall be controlled by the unit controller.
2. The system shall have a gateway controller that allows the controls to interface with the Building Automation Control System via bacNet.

B. Indoor Wall Mounted Unit:

1. Unit shall be compact, lightweight design suitable for wall mounting.
2. Unit vanes adjusts to downflow in heating mode and horizontal airflow in cooling mode.

C. Concealed Ducted Unit:

1. Unit shall have supply and return air openings to allow connection of ductwork.

D. 4-Way Ceiling Cassette Unit (2'x2'):

1. Unit shall supply airflow 4 directions and shall fit in a standard 2'x2' drop ceiling or drywall ceiling.
2. Unit shall include a fresh air intake in the main body.
3. Return air shall be through the concentric panel.

E. Filters:

1. Washable filter

F. Accessories:

1. Condensate pump
2. Hard wired wall mounted sensor.
3. Mounting brackets.

G. Electrical:

1. Factory disconnect on indoor unit.

H. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.
2. Units with filter return grilles shall not require a separate filter.

I. Sound Levels:

1. The indoor units sound pressure shall be 33 dB(A) maximum at low speed measured at 5 feet below the unit.

J. Accessories:

1. Fresh air intake kit
2. Supply air branch duct connections
3. Hard wired wall mounted sensor
4. Mounting brackets

2.3 CONDENSATE PUMPS:

A. General:

1. This pump shall replace any factory supplied pump.
2. The pump shall be powered from the indoor unit.

B. Pump:

1. Electronic water sensing
2. High water cutout
3. Condensate filter
4. 120/1 power
5. 2 GPH @ 18 ft. lift

C. Wall mounted unit:

1. The pump shall be designed to fit in or directly beneath the wall mounted unit.
2. If external to the wall mounted unit, the pump shall be in a casing similar to the wall mounted unit.

D. Manufacturer shall be:

1. EDC Micropump II

PART 3 - EXECUTION

3.1 CONDENSATE DRAIN LINES:

- A. Provide a weather seal grommet where drain penetrates casing and wall sleeve.

3.2 WARRANTY:

A. Compressor Failure:

1. When a compressor fails within the warranty period, the compressor shall be replaced. If the system has multiple compressors on a single refrigerant circuit, and one compressor fails, all compressors shall be replaced during the warranty period.

END OF SECTION 239005

## SECTION 239005.2 - HEAT TRANSFER (ELECTRIC COOLING, VRF SYSTEMS)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of heat transfer equipment (VRF, variable refrigerant flow) and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:
  1. Section 230502 - Common HVAC Materials
  2. Section 239005 – Heat Transfer (Electric Cooling)

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. ARI Standards 210/240, 340, and 360
  - b. ANSI UL – 1995 Heating and Cooling Equipment
  - c. Underwriter's Laboratory
  - d. NFPA 90A
  - e. AMCA 210 Test Code For Air Moving Devices
  - f. National Electric Code
  - g. ASHRAE 15 - Safety Code for Mechanical Refrigeration

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All heating and cooling equipment shall bear the ARI seal.

E. All coils shall be ARI certified.

- F. All electric heaters shall have impedance protection per UL519.
- G. All outdoor cabinets shall meet or exceed the 500 hour salt spray test unless more stringent tests are specified.
- H. Manufacturers:
  - 1. The following variable refrigerant flow manufacturers are acceptable:
    - a. Mitsubishi
    - b. Daikin
    - c. LG
  - 2. The following variable refrigerant flow indoor unit condensate pumps are acceptable:
    - a. Sauermann

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.
- B. System shall be:
  - 1. Heat pump (all units shall operate in heating mode or all units shall operate in cooling mode).
- C. Refrigerant Circuits:
  - 1. All units shall have factory installed high pressure sensor and switch, low pressure sensor, liquid line filter dryer, liquid line sight glass, pressure tap ports, check valves, and suction and liquid service valves.
  - 2. Heat pump units shall also have reversing valve, suction line accumulator, and discharge muffler.
  - 3. Where low ambient control is required, electronic head pressure control shall be provided.
  - 4. Subcooling feature.
  - 5. Refrigerant circuits shall be charged with dehydrated air prior to shipping.

D. Safeties:

1. Heat pumps shall have a solid state defrost control. Defrost shall occur only when coil saturated suction temperature indicates freezing temperatures. Defrosting shall be limited to a maximum of 10 minutes over a 90 minute period.
2. Provide a time-guard device to prevent compressor recycling by requiring a 5-minute delay before restarting.

E. Unit shall be factory assembled and tested.

F. Standard operating range for cooling shall be 23°F to 122°F outdoor ambient except where low ambient controls are required. Heating operating range shall be to 0°F dry bulb outdoor ambient without additional low ambient controls or an auxiliary heat source.

G. Standard operating range for indoor units shall be -14 degrees F to 122 degrees F.

H. System shall continue to provide heat to the indoor units in heating operation while in the defrost mode. Reverse cycle (cooling mode) defrost during heating operation shall not be permitted due to the potential reduction in space temperature.

I. Refrigerant shall be R410A.

J. All motors shall be premium efficiency.

2.2 CONDENSER:

A. Outdoor Cabinets:

1. Unit shall be designed for outdoor installation.
2. Cabinet shall be constructed of heavy duty galvanized steel. Frame and panels shall be 18 gauge minimum. They shall be zinc coated or epoxy coated with a baked-on finish.
3. Prewired control panel.

B. Compressor:

1. The inverter scroll compressors shall be variable speed capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure measured in the condensing unit. Evaporator and condenser temperatures shall be read every 20 seconds and pressures calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient, digitally commutating, hermetically sealed scroll type with a maximum speed of 7,980 rpm.
3. The capacity control range shall be as low as 4% to 100%.

4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. An oil separator with an intelligent oil management system shall be provided.
7. The compressor shall be spring mounted to minimize the transmission of vibration.
8. Minimum number of compressors shall be:
  - a. 6-12 ton – 2 compressors
  - b. 14 ton – 3 compressors
  - c. 16-20 ton – 4 compressors
  - d. 22-24 ton – 5 compressors
9. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required.
10. Compressors shall be started in a sequence to equalize run time of each compressor.

C. Outdoor Coil:

1. The outdoor coil shall be constructed of aluminum spine fin mechanical bonded to seamless copper tubing with all joints brazed.
2. Fins shall be covered with a permanent anti-corrosion coating.
3. Pipe plates shall be treated with powdered polyester resin for corrosion prevention.

D. Outdoor Fans:

1. Fan motors shall be permanently lubricated, weatherproof motors suitable for outdoor use.
2. Motors shall be multiple speed operation via digital commutating inverter.
3. Motor shall have built-in current and thermal overload protection.
4. Fans shall be resiliently mounted and seismically isolated.
5. Fans shall be statically and dynamically balanced.
6. Provide PVC coated fan guard.

E. Electrical (Outdoor Unit):

1. Provide control circuit fuses, crank case heater, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
2. Provide transformer for motor or heaters as required.
3. Transformers shall be factory mounted and wired.
4. Provide a start capacitor for single phase units.

2.3 INDOOR UNIT (GENERAL):

A. General:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. The cabinet shall be constructed with a galvanized steel casing and sound absorbing foamed polystyrene and polyethylene insulation.

B. Fan:

1. The fan shall be direct-drive fan with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall be equipped with adjustable external static pressure settings.
3. The fan motor shall be thermally protected.

C. Coil:

1. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be completely factory tested.
4. A condensate pump with a minimum 21 inch lift shall be located below the coil in ceiling mounted units in the condensate pan. The pump shall have a built-in safety alarm.
5. A thermistor will be located on the liquid and gas line.



D. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

E. Control:

1. The unit shall be equipped with a program drying mechanism that dehumidifies while limiting changes in room temperature.
2. Computerized PID control shall control superheat.
3. Thermistor mounted in the return air.
4. The unit shall be compatible with interfacing with the building automation system via LonWorks or BACnet gateways.

2.4 4-WAY CEILING CASSETTE UNIT (2'x 2'):

A. General:

1. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations. The supply is distributed via motorized louvers which can be adjusted from 0 degrees (horizontal) to 90 degrees (vertical).
2. Return air shall be through the concentric panel.
3. Units shall fit in a 2'x2' drop ceiling.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor units sound pressure shall be 33 dB(A) maximum at low speed measured at 5 feet below the unit.

D. Accessories:

1. Fresh air intake kit.
2. Hard wired wall mounted sensor.
3. Mounting brackets.
4. Condensate pump

2.5 REFRIGERANT PIPING AND SPECIALTIES:

- A. If the manufacturer includes in their literature the option of utilizing specialty refrigerant pipe fittings for controlling or distributing refrigerant flow, these fittings must be furnished and installed at all locations recommended by the manufacturer.
- B. All piping and fittings shall meet the requirements of the manufacturer.

2.6 SYSTEM CONTROLS:

- A. The system shall be controlled by the unit controllers.
- B. The variable refrigerant system shall have a gateway controller that allows the variable refrigerant controls to interface with the Building Automation Control System via bacNet.

PART 3 - EXECUTION

3.1 WARRANTY:

- A. Compressor Failure:
  - 1. When a compressor fails within the warranty period, the compressor shall be replaced. If the system has multiple compressors on a single refrigerant circuit, and one compressor fails, all compressors shall be replaced during the warranty period.

3.2 REFRIGERANT PIPE INSTALLATION:

- A. All pipe shall be installed and leak tested in strict accordance with the manufacturer's requirement using the tools, products, and procedures recommended by the manufacturer.
- B. The system shall be installed by persons who have been trained and certified by the variable refrigerant flow equipment manufacturer.

3.3 SUBMITTALS:

- A. Submit with the equipment submittals the following information:
  - 1. Names and certification numbers of technicians installing the system.
  - 2. Manufacturer's detailed installation procedures.
  - 3. Manufacturer's detailed test procedures.
- B. Submittals shall include detailed piping drawings including length and size of piping and all required fittings. Drawings shall be:
  - 1. Drawn on building floor plan.
  - 2. Be based upon contractor's review of existing conditions.

3. Be based upon review of all bid documents to ensure proper clearance to equipment is provided.

3.4 CONTROL PANELS:

- A. Coordinate control panel locations with the Owner.

END OF SECTION 239005.2

## SECTION 239006 - HEAT TRANSFER (ELECTRIC HEATERS)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of electric heaters and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All sections of Division 23 Specifications apply to this section.

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):
  - a. Underwriters Laboratory
  - b. NFPA 90A
  - c. AMCA 210 Test Code For Air Moving Devices
  - d. National Electric Code

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All electric duct heaters shall be listed by ETL.

E. All electric heaters shall have impedance protection per UL519.

##### F. Manufacturers:

1. The following electric heater manufacturers (except where other electric heater products are specifically listed) are acceptable:
  - a. Trane
  - b. Berko

- c. Markel
- d. Reznor
- e. Airtherm
- f. Raywall
- g. Q-Mark
- h. Reddi

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.

### 2.2 ELECTRIC COILS (AIR HANDLER COILS):

#### A. General:

- 1. Heating elements shall be of the open resistance type with resistance wire of 80% nickel and 20% chromium. Coil elements shall be insulated from surrounding metal casing by ceramic bushings.
- 2. Each coil and its control panel shall be tested in the factory. The tests shall include continuity and dielectric strength tests of all power and control circuits, confirmation tests of primary thermal protection systems and recycle feature of step control systems.
- 3. Recessed portion of wiring compartment shall be internally insulated. No element terminations or control devices shall penetrate the insulation.
- 4. Heater density shall be as recommended by manufacturer for application (i.e., variable airflow, multizone, etc.) but shall not exceed 60 watts/sq. in. density.

#### B. Air Handler Coil:

- 1. Coil shall be designed, tested, and installed by air handler manufacturer to ensure proper operation and uniform flow through the coil.

#### C. Controls:

- 1. Heaters shall have SCR control.
- 2. Control panels shall be fabricated from heavy gauge galvanized steel to conform to NEMA I standards with dust tight enclosure. Panels shall be completely factory wired, assembled and fused.

3. All electrical contactors, relays, thermostats, controllers, wiring, and fuses shall be UL approved.
  4. Each heater circuit shall be 48 amps or less and individually fused in accordance with NEC.
  5. All electrical coils shall have the following thermal protection devices:
    - a. Primary: Automatic reset
    - b. Secondary: Manual reset
  6. Provide control transformer with primary and secondary fusing.
  7. Heaters shall be suitable for horizontal and vertical flow (both directions) and for installation with zero clearance to combustible surfaces.
  8. Door interlocking disconnect with fusing.
  9. Contactors shall be disconnecting break type solid state contactors.
- D. Accessories:
1. Electronic air flow switch.
  2. Conduit assemblies shall be factory wired, available up to 20 feet in length with speed connection devices to connect remote control panels to electric coil junction boxes.
  3. Protective hardware cloth screen on coil inlet.

## 2.3 ELECTRIC UNIT HEATERS:

- A. Casing:
1. All metal surfaces shall be corrosion resistant and finished in baked enamel.
  2. Horizontal unit heaters shall have louver panel rotatable thru 360 degrees.
  3. Vertical unit heaters shall have radial diffusers.
- B. Controls:
1. Provide transformer for fan and control circuit.
  2. Provide a wall mounted thermostat.
  3. Thermal protection shall shut unit off in event of overheating with automatic reset.

- C. Motors:
  - 1. Motors shall be totally enclosed, thermally protected, with sleeve or ball bearings, continuous heavy-duty type, and all angle operation.
- D. Fan:
  - 1. Fan shall be dynamically balanced.
- E. Accessories:
  - 1. Ceiling mounted bracket.
  - 2. Wall mounted bracket.

### PART 3 - EXECUTION

#### 3.1 ELECTRIC COIL:

- A. Shop drawing shall include dimensional drawings plus detailed line and wiring diagrams for power and control circuits showing connections and components.
- B. Coils shall be certified for maximum and minimum design flow.
- C. Coordinate control requirements with the control contractor.

#### 3.2 ELECTRIC UNIT HEATERS:

- A. Louvers and diffusers shall be adjusted for optimal airflow pattern.

END OF SECTION 239006

## SECTION 260500 - ELECTRICAL GENERAL REQUIREMENTS

### PART 1 - GENERAL CONDITIONS

#### 1.1 WORK INCLUDED:

- A. The work covered under these sections of the specifications consists of furnishing all labor, equipment, supplies and materials, and of performing all operations, including cutting, channeling, chasing, excavating and backfilling necessary for the installation of complete wiring systems, raceways, wiring, and electrical equipment in accordance with this section of the specifications and the accompanying drawings.
- B. The Electrical Work shall include, but not be limited to, the following:
  - 1. Electrical distribution system
  - 2. Wiring devices
  - 3. Raceway system
  - 4. Conductors and cables
  - 5. Lighting and lighting controls
  - 6. Empty raceway for IT and technology systems

#### 1.2 RELATED WORK:

- A. Related work to Division 26:
  - 1. Division 1
  - 2. The provisions, conditions, and requirements preceding and including general and supplemental conditions apply to and are a part of Divisions 26, 27 and 28.

#### 1.3 DEFINITIONS:

- A. Provide: Furnish and install complete ready for use, including all accessories required for operation.
- B. Furnish: Purchase and deliver to the project site complete with every necessary appurtenance, support and accessories required for operation.
- C. Install: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.

#### 1.4 DESCRIPTION OF SYSTEMS:

- A. Furnish and install all materials for systems, resulting upon completion, in functioning systems in compliance with performance requirements specified. The omission of



express reference to any parts necessary for or reasonably incidental to a complete installation shall not be construed as a release from furnishing such parts.

- B. The wiring specified and shown on the drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer's requirements shall be made at no cost to either the contract or to the Owner. Changes in electrical service to equipment due to substitutions of equipment by any Divisions of this specification shall be at no additional cost to the Owner.

#### 1.5 QUALITY ASSURANCE:

- A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.
- B. Equipment and material which are not covered by UL Standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards, such as NEMA, ICEA or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- C. All equipment of one type (such as panelboards, breakers, etc.) shall be the products of one manufacturer.

#### 1.6 REQUIREMENTS OF REGULATORY AGENCIES/CODE COMPLIANCE:

- A. Contractors shall submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.
- B. All work shall conform to the following Building Codes:
  - 1. National Electrical Code (NEC-2017)
  - 2. South Carolina Building Code (SCBC 2018)
  - 3. South Carolina Fire Code (SCFC 2018)
- C. All work shall conform to all federal, state and local ordinances.
- D. References to the National Electrical Code and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the NEC and NFPA.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS:

- A. All products shall be new (except where noted) and unused and without blemish or defect.

### 2.2 SUBSTITUTIONS:

- A. All requests for substitutions should be submitted so as to be received by the Architect/Engineer at least 10 working days before bid date and must be approved before award of Contract.
- B. Submittals shall be concise, clear, and brief as possible. Requests shall be accompanied by samples, descriptive literature and engineering information, as necessary, to fully identify and appraise the product.
- C. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a table of compliance that is enclosed with the submittals. The table of compliance shall clearly identify all deviations from the specifications with clear proof of equality for each case of deviation. Each item in the table of compliance shall be marked to show specification reference including the section and paragraph numbers.
- D. Contractor shall be responsible for verifying all dimensions with available space conditions (with provisions for proper access, maintenance, part replacement, and for coordination with other trades--electrical, plumbing, structural, etc.) for proper services, and construction requirements. Contractor to bear any additional cost for required changes in associated items which are directly or indirectly related to a substituted unit.
- E. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required.
- F. Approval of the equipment does not relieve the contractor of the responsibility of furnishing and installing the equipment at no additional cost.
- G. Where Contractor substitutes equipment manufactured by an alternative vendor other than the Specification approved first named manufacturer, the Contractor shall become responsible for the operation of the product in the intended system, including all related costs required to make the design work, function, and fit in the allocated space.

## PART 3 - EXECUTION

END OF SECTION 260500

## SECTION 260501 - ELECTRICAL COORDINATION

### PART 1 - GENERAL CONDITIONS

#### 1.1 INTERPRETATION OF CONTRACT DOCUMENTS:

- A. This section of the specifications and related drawings describe general provisions applicable to every section of Division 26.
- B. Attention is directed to Instructions to Bidders and to Division 1, General Conditions, which are binding in their entirety on this portion of the work in particular to paragraphs concerning materials, workmanship and substitutions.
- C. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the intent diagrammatically expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
- D. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not eliminate the requirement for field coordination for the indicated work.
- E. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

#### 1.2 EXISTING CONDITIONS:

- A. The Contractor shall visit the premises and thoroughly familiarize himself with the details of the work, working conditions, verify dimensions in the field, advise the Architect/Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make, in quadruplicate for approval, before starting the work. Contractor shall install equipment in a manner to avoid building interference.

#### 1.3 SHOP DRAWINGS:

- A. The Contractor shall not purchase any materials or equipment prior to receipt of approved shop drawings.
- B. Prior to assembling or installing the work, prepare and submit shop drawings for the following items of equipment:
  - 1. Switchboards
  - 2. Panelboards
  - 3. Dry Type Transformers

4. Lighting Fixtures
  5. Cable Trays and pathways for IT systems
- C. Submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements.
  - D. Shop drawing sets shall be suitably bound and indexed. Loose sheets are not acceptable.
  - E. Catalog cuts submitted for approval shall be legible and shall clearly identify equipment being submitted. Items of the submittal that have been "faxed" are not acceptable.
  - F. Before preparing drawings, Contractor shall consult contract drawings and specifications in detail, obtain manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and material intended for installation. A principal of the contracting firm shall sign shop drawings (indicating conformance with plans and specifications) before submission
  - G. Approval on shop drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing (and in letter form) called attention to such deviations at the time of submission and secured written approval; nor shall it relieve him from responsibility for errors in shop drawings or schedules.
  - H. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

#### 1.4 AS-BUILT DRAWINGS:

- A. The Contractor shall keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of items, material, and equipment on these job drawings.
- B. At the time of final inspection, two corrected sets of drawings shall be delivered to the Architect. Drawing costs to be by the Contractor.
- C. Corrected sets shall be made by obtaining a sepia of the applicable contract drawings. Sepia prints shall be corrected deleting incorrect locations and showing installed locations in accordance with information transferred from job drawings.
- D. Provide an additional set of corrected drawings in a moisture proof storage tube and mount the tube in the main electrical room.

#### 1.5 OWNER'S MANUAL:

- A. The Contractor shall submit to the Architect six identical manuals that contain manufacturer's brochures of items installed by the Electrical Contractor.
- B. The cover of the manual shall state the following information:

1. Project Name
2. Location
3. Owner
4. Architect
5. Electrical Engineer
6. Electrical Contractor (name, address, phone number)
7. General Contractor
8. Project Supervisors (general and electrical)
9. Date Of Project Completion

1.6 OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. After final tests and adjustments have been completed, a competent employee of the Contractor shall be provided to instruct the Owner's Representative in details of operation and maintenance for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is qualified to take over operation and maintenance procedures. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

1.7 MAINTENANCE MATERIALS:

- A. All special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Owner's Representative and a receipt requested for same.
- B. Where specified, provide Owner's Representative with spare parts, equipment and materials and request a receipt for same.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION:

- A. In addition to the requirements of the National Electrical Code, install an identification sign which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchgear and motor control assemblies, control devices and other significant equipment.
- B. Nameplates shall be laminated black phenolic resin with a white core and engraved lettering, a minimum of 1/4-inch high. Nameplates that are furnished by manufacturer, as a standard catalog item, or where other methods of identification is herein specified, are exceptions.

2.2 UNDERGROUND WARNING TAPE:

- A. Furnish and install a six (6) inch wide polyethylene tape, permanently colored yellow, for electric underground work (outside the building) with wording indicating type of service and "caution". Install twelve (12) inches below finished grade and directly above underground equipment.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

- A. Inspection:
  - 1. Prior to any Work, the Contractor shall carefully inspect the installed Work of other Trades and verify that such Work is complete to the point where his installation may properly commence.
  - 2. Verify that equipment may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Discrepancies:
  - 1. In the event of discrepancy, immediately notify the Architect Engineer.
  - 2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.
- C. Return to original (pre-construction) condition any paved areas, sidewalks, planting, etc., disturbed during electrical system installation.

3.2 INSTALLATION:

- A. Install equipment in strict accordance with the manufacturer's recommendations and the shop drawings approved by the Engineer.
- B. Secure equipment using fasteners suitable for the use, materials, and loads encountered. If requested, submit evidence proving suitability. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions, unless indicated otherwise.
- C. Coordinated electrical systems, equipment and materials complete with auxiliaries and accessories shall be installed. Remove, modify, relocate and reinstall the existing electrical equipment and materials as shown.
- D. Equipment location: Shall be as close as practicable to locations shown on drawings.
- E. Working spaces shall be not less than specified in the National Electrical Code for voltages specified.
- F. Inaccessible Equipment:

1. Where the Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.

G. Equipment and Materials:

1. New equipment and materials shall be installed unless otherwise specified.
2. Equipment and materials shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, vapor-proof, watertight and weatherproof construction.

3.3 COORDINATION WITH OTHER TRADES:

- A. Coordinate work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings, and shall make sure that proposed equipment can be accommodated. If interferences occur, Contractor shall bring them to the attention of Architect/Engineer, in writing, prior to signing of contract; or, Contractor shall, at his own expense, provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interferences.

3.4 SERVICE CONTINUITY:

- A. Electric service shall be maintained to the site during construction except with prior written approval of interruptions. Any required interruptions of electric service due to work being performed under this contract shall be scheduled in advance after consultation with the Architect and the Owner and shall generally occur between the hours of five o'clock p.m. and five o'clock a.m. The Contractor shall be responsible for any material and labor costs, including overtime pay, to meet these requirements as part of the Division 26 scope of work.
- B. At least 14 days prior to the requirement of any interruption of electrical service, the Contractor shall furnish to the Architect for approval a written plan for the work associated with the outage including a description of the installation and removal of temporary wiring and facilities necessary to be installed.

3.5 WORK PERFORMANCE:

- A. Arrange, phase and perform work to assure electrical service is maintained for other buildings during construction. See General Methods of Procedure under Section GENERAL REQUIREMENTS.
- B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior condition.

- C. Coordinate location of equipment and conduit with other trades to minimize interferences.
- D. Cutting of Holes:
  - 1. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills shall not be allowed.
  - 2. Holes shall be located so as not to affect structural sections such as ribs or beams.
  - 3. Holes shall be laid out in advance. The Architect shall be advised prior to drilling through structural sections, for determination of proper layout.
- E. Where conduits, wireways, busduct, and other electrical raceways pass through fire partitions, fire walls or walls and floors, install a firestop that provides an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight, and completely fill clearances between raceways and openings. Installation of fire-stop material shall conform to Section 260503 Cutting, Patching and Repair, Firestopping.
- F. Hangers and other supports shall support only electrical equipment and materials. Provide not less than a safety factor of 5, which shall conform with any specific requirements as shown on the drawings or in the specifications.
- G. In security areas, exposed equipment and materials, including screws and other fasteners, shall be tamperproof. Cover plates shall have beveled edges.
- H. Exposed conduit shall be painted, see Section 09900 PAINTING.

### 3.6 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT:

- A. Protect materials and equipment from damage during storage at the Site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.
- B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering with securely fastened protective rigid or flexible waterproof coverings.
- C. Conduit shall be protected by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation in the piping.
- D. During construction cap the top of conduits and raceway installed vertically.
- E. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter on the inside; and be vacuum cleaned both inside and outside before testing, operating and painting.
- F. Damaged equipment shall be placed in first class operating condition or be returned to source of supply for repair or replacement.



- G. Painted surfaces shall be protected with removable heavy kraft paper, sheet vinyl or equal, installed at the factory, and removed prior to final inspection.
- H. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with same quality of paint and workmanship as used by manufacturer so repaired areas are not obvious.

3.7 DISPOSITION OF EXISTING MATERIAL AND EQUIPMENT:

- A. All material and equipment which is noted, specified, or required by the Owner to be salvaged and which is not scheduled to be reused or relocated shall be carefully removed and shall be delivered to the Owner and stored where directed on the site.
- B. Carefully remove and store on the site material and equipment noted or specified to be reused or relocated. Thoroughly clean this equipment prior to installation.
- C. Remove materials or debris resulting from demolition operations from the site.

3.8 EXCAVATING, TRENCHING, BACKFILLING AND RESURFACING:

- A. Perform work as required, indicated, and in compliance with site work. Excavation depths indicated are below finished grade unless noted otherwise.
- B. Do not excavate below required depth except as necessary for removal of unstable soil. Unless indicated otherwise, pitch electrical conduit runs downward away from buildings.
- C. Where backfill compaction is critical (e.g. under floor slabs, roadways, sidewalks, trenches deeper than four feet), test the degree of compaction each 75 linear feet of trench and each two feet of depth. Test as required by Division - "Sitework" and compact backfill until density is acceptable.
- D. Repair the excavated area to original pre-excavation condition. Repair and replace sidewalks, roadways, etc.

3.9 IDENTIFICATION:

- A. Upper case letters of uniform height; centered on device, coverplate, or enclosure; engraved letters filled with a contrasting color; and characters made clearly and distinctly.
- B. Use abbreviations defined in the contract documents whenever possible. Use plan designations for labeling, unless indicated otherwise. Indicate loads served using designations from electrical schedules and designations from the trade furnishing the equipment served.
- C. Label the following with marking pen.
  - 1. Junction boxes or portions of junction boxes with 277 or 480 volt wiring; communications system pull and junction boxes; and pull, junction boxes, and raceway installed above ceilings and for future use. Label inside covers in exterior locations and outside covers in unfinished areas.

- D. Label feeder conductors and control conductors with self adhesive, numbered labeling tapes; Brady Co. or equal. Indicate feeder numbers on feeders and terminal numbers for control conductors. Label conductors at origin and destination points and at junction boxes where two or more feeder or control circuits are present.

3.10 ACCESS TO EQUIPMENT:

- A. Equipment shall be installed in location and manner that will allow for convenient access for maintenance and inspection.

3.11 CONNECTION OF EQUIPMENT FURNISHED AND INSTALLED UNDER OTHER DIVISIONS OF THE WORK:

- A. This Contractor shall rough-in and make final electrical connection to pieces of equipment requiring electrical connections. Such equipment being furnished and installed under other Divisions of the Work. Installations shall be functional and code complying.
- B. This Contractor shall provide whatever incidental devices are necessary for final connection, such as, but not necessarily limited to outlet boxes, receptacles, connectors, clamps and switches.

3.12 GENERAL COMPLETION AND DEMONSTRATION:

- A. Results expected:
  - 1. Systems shall be complete and operational, and controls shall be set and calibrated.
  - 2. Testing, start-up and cleaning work shall be complete.
- B. Demonstration:
  - 1. Upon notification by the Contractors, the Engineer will visit the project for a demonstration of the building system and an inspection of the completed work.
  - 2. Items which do not comply with the Contract Documents or which function incorrectly will be listed, and the list will be submitted by the Engineer to the Contractors for repairs.

3.13 CLEANING:

- A. Periodically clean during construction and prior to Owner acceptance of the building, Contractor shall remove from the premises and dispose of packing material and debris.
- B. Clear away debris and surplus material resulting from electrical work. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

END OF SECTION 260501

## SECTION 260502 - ELECTRICAL DEMOLITION

### PART 1 - GENERAL

#### 1.1 SCOPE:

- A. This section describes the electrical demolition work to be done to existing facilities.
- B. The term demolition, as used in this specification, shall mean removal of electrical equipment as shown on the demolition plans or as described herein.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26 sections

#### 1.3 WORK INCLUDED:

- A. The work under this section consists of furnishing equipment, performing labor and services necessary for the demolition and removal of the electrical system shown on the drawings and hereinafter noted.

#### 1.4 SALVAGED MATERIALS:

- A. The Owner shall have priority for the selection of salvaged material and equipment. Any equipment and material selected to remain the property of the Owner shall be removed and delivered to a location on the site as designated by the Owner. Material and equipment not retained by the Owner shall become the property of the Contractor and shall be removed from the site by him.

### PART 2 - PRODUCTS

NOT APPLICABLE

### PART 3 - EXECUTION

#### 3.1 EXAMINATION:

- A. Verify field measurements and circuiting arrangements prior to commencement of work.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.

3.2 PREPARATION:

- A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- B. Reconnect existing circuits and services interrupted by demolition.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK:

- A. Remove abandoned wiring to source of supply.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.

END OF SECTION 260502

## SECTION 260503 - CUTTING, PATCHING AND REPAIR

### PART 1 - GENERAL REQUIREMENTS

#### 1.1 SCOPE OF WORK:

- A. Cutting: Furnish all labor, materials, tools and equipment and perform all operations in connection with the cutting of new and existing building structure, finishes and building assemblies as specified hereinafter.
- B. Patching: Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of watertight sealant as required to seal voids or gaps around Division 26000 equipment at penetrations through exterior floors, walls, and roof systems.
- C. Repair: Furnish all labor, materials, tools and equipment required to repair all existing or new building components and finishes, outside components, landscaping, utilities, or other appurtenances that are damaged as a result of the performance of this contract.
- D. All existing utilities, feeders, branch circuits, signal wiring, control wiring, etc. shall be reconnected to new or existing systems as required to maintain the same functions as existed prior to new work.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26 sections
  - 3. All Division 27 and 28 sections

#### 1.3 QUALITY ASSURANCE:

- A. Sealants shall equal or exceed all requirements of ASTM E-814.
- B. All applicable codes as stated elsewhere in these specifications for the type of work performed.

### PART 2 - PRODUCTS

#### 2.1 WATERPROOFING:

- A. Exterior joint sealant shall be Polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A"

hardness of minimum 15 and maximum 50; non-staining; non-bleeding; colors selected by Architect/Engineer.

B. The following waterproofing sealant manufacturers are acceptable:

1. TREMCO
2. Sonneborn - Contech
3. W. R. Meadows

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. Patch and repair all building finishes, structural components, or other appurtenances that are damaged as a result of the performance of this contract. Patch and repair work shall include finishes, components, substructure and materials required for the installation of such work in accordance with standard practices.
- B. Replace all building components, outside components, shrubbery, or other appurtenances which are damaged beyond repair. Replacement item(s) shall be of equal or higher quality than the original item(s).
- C. All penetrations thru exterior floors, walls, and roof systems shall be sealed watertight.
- D. All roof penetrations shall be patched in accordance with roofing manufacturers' recommendations.
- E. Patched and repaired work shall be finished to match existing or adjacent construction and conditions.

#### 3.2 INSTALLATION OF SEALANT MATERIALS:

- A. Install materials in accordance with manufacturer's recommendations for installation of these materials.
- B. Clean and prepare joints for sealant application in accordance with manufacturer's recommendations. Ensure that joint forming materials are compatible with sealant. Use joint filler to achieve required joint depths. Apply primers as recommended by sealant manufacturer.
- C. Openings larger than required for proper installation of electrical raceways or conduits shall be patched or repaired.

END OF SECTION 260503

SECTION 260519 - WIRE AND CABLE - BUILDING WIRE (600 VOLTS AND BELOW)

PART 1 - GENERAL

1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of the building wire for power and lighting circuits.
- B. Unless otherwise specified in other sections of these specifications, control wiring shall be provided, installed, and connected to perform the functions specified in other sections of these specifications.
- C. Unless otherwise specified in other sections of these specifications, communication and signal wiring shall be provided, installed, and connected to perform the function specified in other sections of these specifications.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections

1.3 WORK INCLUDED:

- A. The work under this section consists of furnishing materials and equipment, performing labor and services necessary for the installation of the electrical cable and wiring system shown on the drawings and hereinafter specified.

1.4 APPLICABLE PUBLICATIONS:

- 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
    - No. 70 . . . . .National Electrical Code (NEC)
  - 2. Underwriters' Laboratories, Inc. (UL) Publications:
    - No. 44 . . . . .Rubber-Insulated Wire and Cables
    - No. 83 . . . . .Thermoplastic-Insulated Wires

No 493 . . . . .Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables

No. 486. . . . .Wire Connectors and Soldering Lugs

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Building Wire (Power and Lighting):

1. Cable and wire shall be in accordance with UL, NEC, as shown on the drawings, and as hereinafter specified.
2. Conductors:
  - a. Shall be annealed copper.
  - b. Shall be stranded for sizes No. 8 and larger. Sizes No. 10, and smaller shall be solid.
  - c. Size shall be not less than shown on the drawings. Minimum size shall be No. 12 AWG.
3. Insulation: Unless otherwise shown on the drawings, insulation shall be as follows:
  - a. THWN - Dry Locations.
  - b. THHN - Dry, Damp Locations.
  - c. XHHW - Dry, Damp, Wet Locations.
4. Color Code:
  - a. All secondary service, feeder, and branch circuit conductors shall be color coded as follows:

<u>208/120 Volt</u>	<u>Phase</u>
Black	A
Red	B
Blue	C
White	Neutral
  - b. All No. 12 and No. 10 branch circuit conductors shall have solid color compound or solid color coating.



- c. No. 8 AWG and larger phase conductors shall have either:
  - 1) Solid color compound or solid color coating.
  - 2) Stripes, bands, or hash marks of colors specified above.
  - 3) Colored pressure-sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of three inches for all terminal points, and in all junction boxes, pull boxes, troughs, manholes, and handholes. Tape shall be 3/4-inch wide with colors as specified above. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.
- d. The neutral conductor shall have a colored strip matching the phase conductor color it is paired with where dedicated neutral conductors for single phase circuits are shown.
- e. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.

B. Splices and Joints:

- 1. Shall be in accordance with UL and NEC.
- 2. Branch circuits (No. 10 AWG and smaller):
  - a. Connectors shall be solderless, screw-on, pressure cable type, 600 volt, 105 degree C, with integral insulation. They shall be approved for copper conductors, and shall be reusable.
  - b. The integral insulator shall have a skirt to completely cover the stripped wires.
  - c. The number, size, and combination of conductors as listed on the manufacturers packaging shall be strictly complied with.
- 3. Feeder Circuits:
  - a. Connectors shall be indent, hex screw, or bolt clamp-type. Material shall be high conductivity and corrosion-resistant.
  - b. Connectors for cable sizes 250 MCM and larger shall have not less than two compression indents.
  - c. Splices and joints shall be insulated with materials approved for the particular use, location, voltage, and temperature. Insulation shall be not less than that of the conductors being joined.

- d. Plastic electrical insulating tape:
  - 1) Tape shall be flame retardant, cold and weather resistant.
- C. Control Wiring:
  - 1. Unless otherwise specified in other sections of these specifications, control wiring shall be as specified for power and lighting wiring.
  - 2. Wire size shall be large enough so that the voltage drop under inrush conditions will not adversely affect operation of the controls.
- D. Wire Lubricating Compound shall be suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, as shown on the drawings, and as hereinafter specified.
- B. All wiring shall be installed in raceway systems, except where direct burial is shown on the drawings.
- C. Cables and wires shall be spliced only in outlet boxes, junction boxes, pull boxes, manholes, or handholes.
- D. Cable supports shall be installed for all vertical feeders in accordance with the NEC. They shall be of the split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- E. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.
- F. Cable and wire entering a building from underground shall be sealed between the wire and conduit, where the cable exits the conduit, with a nonhardening approved compound.
- G. Wire Pulling:
  - 1. Suitable installation equipment shall be provided to prevent cutting or abrasion of conduits during pulling of feeders.
  - 2. Ropes used for pulling feeders shall be made of suitable nonmetallic material.
  - 3. Pulling lines for feeders shall be attached by means of either woven basket grips or pulling eyes attached directly to the conductors.
  - 4. All cables to be pulled in a single conduit shall be pulled in together.

3.2 FIELD TESTING:

- A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.
- B. Test shall be performed by megger and conductors shall test free from short-circuits, grounds, and opens.
- C. Conductors shall be tested phase-to-phase and phase-to-ground.
- D. Record test results and include report within the OWNER'S MANUAL.

END OF SECTION 260519

## SECTION 260526 - GROUNDING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. This section includes the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, grounding systems.
- B. The term ground, as used in this specification, shall mean any of the grounding types specified.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26 sections

#### 1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL listed and labeled.
- B. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical grounding and bonding.
- C. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

### PART 2 - PRODUCTION

#### 2.1 GENERAL:

- A. Provide electrical grounding systems with assembly of materials, including cables/wires, connectors, terminals, solderless lugs, grounding rod/electrodes, bonding jumper braid and additional accessories needed for complete installation. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE and established industry standards.

#### 2.2 GROUNDING CONDUCTORS:

- A. Shall be UL and NEC approved types, copper, with insulation color identified green, except where otherwise shown on the drawings, or specified.
- B. Wire size shall not be less than #12 AWG and not less than required by the NEC.

2.3 GROUND RODS:

- A. Ground rods shall be copperclad steel, 3/4 inch diameter by minimum ten feet long.

2.4 GROUNDING CLAMPS:

- A. Clamps for connection of grounding electrode conductors to metal piping 1" and less in diameter shall be cast brass/bronze and of the single screw type design.
- B. Clamps for bonding of metal piping for 1" through 6" in diameter shall be bronze or brass and of the U-bolt type.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL GROUNDING:

- A. General: Install electrical grounding systems in accordance with applicable portions of NEC, with NECA's "Standard of Installation," and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions.
- B. Coordinate with other electrical work as necessary to interface installation of electrical grounding system with other work.
- C. Weld grounding conductors to underground grounding rods/electrodes.
- D. Connection to structural steel building components shall be made utilizing exothermic welding. Bolted connections for bonding to steel building components shall only be used in load bearing masonry construction when connecting to bar joist roofing systems.

3.2 FEEDERS AND BRANCH CIRCUITS:

- A. Install green insulated equipment grounding conductors with feeders and branch circuits. Conductors shall be sized in accordance with NEC Article 250.

3.3 EQUIPMENT GROUNDS:

- A. All equipment that has electrical connections (lights, receptacles, panels, and utilization equipment) shall have a ground wire connected that is directly tied to the ground bus of the panel which serves it.
- B. Fixed electrical appliances and equipment shall have a ground lug installed and provided by this contractor for termination of the green ground conductor.

3.4 CONDUCTIVE PIPING:

- A. Bond conductive piping systems in the building whether furnished and installed by this contractor or not to the electrical system ground. Bonding connections shall be made as close as practical to the water pipe ground or service equipment ground bus.

3.5 GROUND ROD INSTALLATION:

- A. Distance: Drive each rod vertically for not less than ten feet.
- B. Multiple Rods: Where required to obtain the specified ground resistance, install multiple rods.
- C. Make the connections by the exothermic process to form solid metal joints.
- D. Where rock prevents the driving of vertical ground rods, install grounding electrodes in trenches and of suitable length to achieve the specified resistance.

3.6 FIELD QUALITY CONTROL:

- A. Upon completion of installation of electrical grounding systems, test ground resistance with ground resistance tester. Where tests show resistance to ground over 3 ohms, take appropriate action to reduce resistance to 3 ohms, or less, by driving additional ground rods and/or by chemically treating soil encircling ground rod; then retest to demonstrate compliance. Ground resistance tests shall be performed utilizing fall-of-potential test method for ground resistance measurements.
- B. Record results of ground resistance tests and corrective actions and include copies within the Operation and Maintenance Manual.

END OF SECTION 260526

## SECTION 260533 - CONDUITS/RACEWAYS AND FITTINGS

### PART 1 - GENERAL

#### 1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, grounded raceway systems.
- B. Types of raceways in this section include the following:
  - 1. Rigid metal conduit (RMC or GRC)
  - 2. Intermediate metal conduit (IMC)
  - 3. Electrical metallic tubing (EMT)
  - 4. Flexible metal conduit (FMT)
  - 5. Liquidtight flexible metal conduit (LFMC)
  - 6. Rigid PVC conduit (PVC)
- C. The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections

#### 1.3 QUALITY ASSURANCE:

- A. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- B. UL Compliance and Labeling: Comply with provisions of UL safety standards pertaining to raceways systems; and, provide products and components which have been UL listed and labeled.
- C. NEC Compliance: Comply with requirements as applicable to construction and installation of raceway systems.

## PART 2 - PRODUCTS

### 2.1 RIGID METAL CONDUIT (RMC OR GRC):

- A. Rigid metal steel conduit shall conform to ANSI C80.1 and Underwriter's Laboratories UL-6 specification, ANSI C80.1.
- B. Conduit shall be hot-dipped galvanized to provide a corrosion resistant coating.
- C. Fittings: Fittings shall be ANSI/NEMA FB 1 threaded type, hot dipped or electronic plated. Threaded conduit to be secured to boxes, cabinets, etc., by means of galvanized threaded bushings on the inside and bond-type locknuts on the inside and outside of such boxes and cabinets. Fittings shall be watertight and the same material as conduit installed with factory manufactured elbows.

### 2.2 RIGID INTERMEDIATE STEEL CONDUIT (IMC):

- A. Intermediate Metallic Conduit shall conform to ANSI C80.1 and proposed Underwriter's Laboratories UL 1242 specification.
- B. Conduit shall be hot-dipped galvanized to provide a corrosion resistant coating. Intermediate Metallic Conduit (IMC) shall have galvanized/metallized thread protection, and pipe interior shall be protected by corrosion inhibiting coating.
- C. Fittings: Shall be similar to GRC.
- D. Maximum allowable size shall be (4) inches.

### 2.3 ELECTRICAL METALLIC TUBING (EMT):

- A. Electrical metallic tubing shall conform to ANSI C80.3 and Underwriter's Laboratories UL 797.
- B. EMT shall be hot-dipped galvanized steel with internal coating of silicone epoxy lubricant to assist in wire pulling.
- C. Fittings: Shall be compression type, steel or malleable iron. Set screw or indentation type of fittings are not acceptable.
- D. EMT conduits shall be factory painted. Color Code shall be as follows:
  - 1. 208V, 120V wiring systems – no color code, silver
  - 2. IT systems, telephone, data – blue

### 2.4 FLEXIBLE METAL CONDUIT (FMC):

- A. Flexible metal conduit shall conform to UL 1.
- B. Flexible conduit to be of hot-dipped galvanized interlocked spirally wound steel strip.



- C. Fittings shall be multiple point type, threading into the internal wall of the conduit convolutions, and shall have insulated throat. Connectors to be galvanized and be suitable for connection to associated boxes and conduits.

2.5 LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC):

- A. Liquid-tight flexible metal conduit shall conform to UL 360.
- B. Liquid-tight flexible metal conduit shall consist of flexible galvanized steel tubing over which is extruded a liquid-tight jacket of polyvinyl chloride (PVC). Conduit shall be provided with a continuous copper bonding conductor wound spirally between the convolutions.
- C. Fittings used shall be reusable type of malleable iron/steel construction, electro zinc plated inside and outside, furnished with nylon insulated throat and taper threaded hub. Connectors to be galvanized and be suitable for connection to associated boxes and conduits.

2.6 RIGID PVC (PVC):

- A. Conduit shall be UL rated 90°C and to UL-651. Fittings shall conform to UL-514.
- B. Conduit shall be S40 wall thickness made from polyvinyl chloride (recognized by UL) compound which includes inert modifier to improve weatherability and heat distortion. Conduit and couplings shall be homogenous plastic material free from visible cracks, holes, or foreign inclusions. Conduit bore shall be smooth and free from blisters, nicks, or other imperfections which could mar conductors or cables.
- C. Bends: 90° bends shall be made with galvanized rigid steel elbows. Bends other than 90° shall be made from S80 PVC conduit.

2.7 EXPANSION AND DEFLECTION COUPLINGS:

- A. UL 467 and UL 514 shall apply.
- B. Shall accommodate, 1.9 cm (0.75 inch) deflection, expansion, or contraction in any direction, and shall allow 30 degree angular deflections.
- C. Shall include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
- D. Shall be watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid or intermediate metal conduit.
- E. Jacket shall be flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

2.8 CONDUIT SUPPORTS:

- A. Parts and hardware shall be zinc-coated or have equivalent corrosion protection.

- B. Pipe straps: Fed. Spec. FF-S-760, type 1, style A or B.
- C. Individual conduit hangers: Shall be designed for the purpose, and have pre-assembled closure bolt and nut, and provisions for receiving hanger rod.
- D. Multiple conduit (trapeze) hangers shall be not less than 1-1/2 x 1-1/2 inch, 12 gage steel, cold formed, lipped channels. Hanger rods shall be not less than 3/8 inch diameter steel.
- E. Solid masonry and concrete anchors: Fed. Spec. FF-S-325 shall apply. Anchors shall be GROUP III self-drilling expansion shields, or machine bolt expansion anchors GROUP II type 2 or 4, or GROUP VII.

### PART 3 - EXECUTION

#### 3.1 CONDUIT INSTALLATION SCHEDULE:

- A. Conduits utilized shall be metallic conduit types listed in this specification. Metallic conduit types shall be applied for specific system types as follows:
  - 1. Power distribution feeders such as feeders for switchboards, panelboard, transformers, etc.:
    - a. Wet or damp locations exposed or concealed - RMC or IMC
    - b. Dry locations exposed or concealed - EMT.
    - c. Below slabs on grade or underground outside of building - PVC
  - 2. Branch circuits from panelboards (not described above):
    - a. Wet or damp locations exposed or concealed - RMC or IMC
    - b. Dry locations exposed or concealed - EMT.
    - c. Below slabs on grade or underground outside of building - PVC
  - 3. Low voltage systems such as building automation and control systems, information technology systems, etc: Same requirements as branch circuits.

#### 3.2 CONDUIT INSTALLATION:

- A. Installation shall be in accordance with UL, NEC, as shown on the drawings, and as hereinafter specified.
- B. Contractor shall lay out and install conduit runs to avoid proximity to hot pipes. In no case will a conduit be run within three inches of such pipes, except where crossings are unavoidable and then conduit shall be kept at least one inch from the covering on pipe crossed.
- C. Conduits shall be supported as required to comply with applicable paragraphs of the NEC.

- D. Conduit installation shall be as follows:
1. Installed as complete runs before pulling in cables or wires.
  2. Flattened, dented, crushed or deformed conduit is not permitted and shall be removed and replaced at no cost to the Owner.
  3. Installed so they will not obstruct head room, walkways, doorways or work by other trades.
  4. Cut square with a hacksaw, reamed, burrs removed, and drawn up tight.
  5. Mechanically continuous.
    - a. Metallic raceway shall also be electrically continuous.
  6. Supported within one foot of changes of direction, and within one foot of each enclosure to which connected.
  7. Ends of empty conduit to be closed with plugs or caps at rough-in stage to prevent entry of debris until wires are pulled in.
  8. Conduits shall be secured to cabinets, junction boxes, pull boxes, and outlet boxes by bonding type locknuts.
  9. See architectural detail for conduit penetrations of roof membrane.
- E. Conduit Bends:
1. Shall be made with standard conduit bending machines.
  2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.
  3. Conduits shall not be bent with a pipe tee or vice.
- F. Conduit shall be securely fastened in place at intervals as specified by the code using suitable straps, hangers and other supporting assemblies. Strap hangers and supporting assemblies:
1. Shall be of rugged construction capable of supporting weight with a reasonable factor of safety.
  2. Spacers and supporting straps shall be of rugged malleable iron or steel construction hot dipped galvanized.
  3. Shall be adequately protected against corrosion.
- G. In wet locations or in locations where corrosive conditions are present, vertical and horizontal runs of conduit shall be firmly supported so that there is at least 1/4" air space between the conduit and the wall or supporting surface. Spacers and supporting straps shall be of malleable iron construction, hot dipped galvanized.

- H. Flexible conduit when installed shall have sufficient slack to avoid sharp flexing and straining due to vibration and thermal expansion/construction. Conduit shall be installed in such a manner that liquids will tend to run off the surface instead of draining towards the fittings.
- I. Concealed work installation:
1. In cast-in-place:
    - a. Conduits may be installed in concrete that is at least 3 times conduit trade size in thickness but in no case less than 3" thick.
    - b. Conduit shall be run in direct lines.
    - c. Conduit may be installed through concrete beams where shown on the structural drawings or as approved by the Engineer prior to installation.
      - 1) Submit drawings showing locations size, and position of each proposed penetration for review prior to installation.
    - d. Spacing between conduits in slab shall be approximately six conduit diameters apart except one conduit diameter at conduit crossings.
    - e. Conduits shall be installed approximately at the center of the slab.
    - f. Couplings and connections shall be concrete tight. Thread compounds shall be UL approved conductive type to ensure low resistance ground continuity through the conduits.
  2. In CMU (Concrete Masonry Unit) Walls:
    - a. Conduits shall run vertically within CMU walls except where noted on the drawings or as approved by the Engineer prior to construction.
  3. Conduit shall be run parallel or perpendicular to the building lines.
  4. Branch circuit conduits, and conduits feeding ceiling lighting shall be supported independently from suspended ceiling, lighting fixtures, or air conditioning ducts.
  5. Recessed lighting fixtures shall be connected to conduit with not over six feet of flexible metal conduit.
- J. Exposed work installation:
1. Conduit shall be run parallel or perpendicular to the building lines.
  2. Horizontal runs shall be installed close to the ceiling or beams and secured with approved conduit straps.
  3. Horizontal or vertical runs shall be supported at not over eight foot intervals.

- K. Installation underground or below slabs on grade:
1. Tops of conduits shall be:
    - a. Not less than 24 inches and not less than shown on the drawings below finished grade.
    - b. Not less than 30 inches and not less than shown on the drawings below road and other paved surfaces.
  2. Conduits shall be installed below power company direct burial primary feeders where encountered. Coordinate spacing below primary feeder with utility company.
  3. Underground conduits shall be encased in not less than 3" of red cast-in-place concrete (all around) where run outside of buildings or equipment pads.
- L. Transition from PVC to metallic conduit:
1. Where PVC conduit exits permitted locations, coated rigid galvanized or IMC conduits shall be utilized for the transition. Acceptable coatings are factory applied PVC or field applied spray bituminous or tape coatings intended for the application.
    - a. Where conduits transition under pad-mounted equipment enclosures such as switchboards, generators or pad-mounted transformers, it shall be acceptable to utilize PVC for the transition.
  2. Transition to metallic conduits shall occur minimum 12 times conduit trade diameter prior to exit from permitted locations. Distance shall be measured from point of exit for horizontal transitions and from center of conduit at point of exit for horizontal to vertical transitions.
- M. Surface metal raceways:
1. Surface metal raceways shall be used only where shown on the drawings.

### 3.3 MOTORS AND VIBRATING EQUIPMENT:

- A. Flexible metal conduit shall be used for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Flexible metal conduit shall be liquid-tight when installed in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, and locations subject to seepage or dripping of oil, grease or water. Flexible metal conduit shall be installed with green ground wire.

### 3.4 EXPANSION JOINTS:

- A. Conduits 3 inches and larger, rigidly secured to building construction on opposite sides of a building expansion joint, shall be provided with expansion and deflection couplings. The couplings shall be installed in accordance with the manufacturer's recommendations.

- B. Conduits smaller than 3 inches shall be provided with junction boxes on both sides of the expansion joint, and connected by 15 inches of slack flexible conduit. Flexible conduit shall have a copper green ground bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above may be installed.
- C. Expansion and deflection couplings shall also be installed where shown on the drawings.

### 3.5 CONDUIT SUPPORTS, INSTALLATION:

- A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
- B. Pipe straps or individual conduit hangers shall be used for supporting individual conduits.
- C. Multiple conduit runs shall be supported by trapeze hangers. Trapeze hangers shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 200 pounds. Each conduit shall be attached by U-bolt or other approved fastener.
- D. Conduit shall be supported independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, etc.
- E. Solid Masonry and Concrete: Fasteners shall be as follows:
  - 1. New construction: Generally, steel or malleable iron concrete inserts in concrete prior to pouring.
  - 2. Existing construction:
    - a. Steel expansion anchors not less than 1/4-inch bolt size and not less than 1-1/8 inch embedment.
    - b. Power set fasteners shall be approved, and not less than 1/4-inch diameter with depth of penetration not less than three inches.
    - c. Anchors or fasteners attached to concrete ceilings shall be vibration and shock resistant.
- F. Hollow masonry. Toggle bolts are permitted. Bolts supported only by plaster are not acceptable.
- G. Metal structures. Fasteners shall be machine screw or devices specifically designed and approved for the application.
- H. Attachments by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking is not permitted.
- I. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- J. Vertical supports. Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown on the drawings. Supports for cable and wire shall have fittings which include internal wedges and retaining collars.

3.6 LOW VOLTAGE SYSTEM CONDUIT:

- A. Minimum size conduit shall be 3/4", but not less than shown on the drawings.
- B. Conduit bends and elbows shall be long radius.

3.7 PULL WIRES:

- A. Install a # 14 gauge fish wire in empty conduits, except telephone and communications.  
Install a nylon pull string in telephone and communication conduits.

3.8 PAINTING:

- A. Exposed conduits in finished spaces shall be painted to match adjacent building finishes.

3.9 PULL WIRES:

- A. Install a # 14 gauge fish wire in empty conduits, except telephone and communications.  
Install a nylon pull string in telephone and communication conduits.

END OF SECTION 260533

## SECTION 260535 - ELECTRICAL BOXES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. This section includes the furnishing, installation and connection of all outlet boxes, junction boxes, and floor boxes as shown on the drawings or as required to house the intended wiring, devices or equipment.
- B. Types of electrical boxes and fittings specified in this section include the following:
  - 1. Outlet boxes
  - 2. Junction boxes
  - 3. Pull boxes
  - 4. Bushings
  - 5. Locknuts
  - 6. Knockout closures

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections
- B. Other systems specified in Division 26000 may call for special boxes not covered in section 26 0535.

#### 1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- B. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL listed and labeled.
- C. NEMA Compliance: Comply with applicable requirements of NEMA Stds./Pub No.'s OS1, OS2, and Pub 250 pertaining to outlet and device boxes, covers, and box supports.



## PART 2 - PRODUCTS

### 2.1 FABRICATED MATERIALS:

- A. Outlet and Device Boxes (dry interior locations): Provide galvanized coated sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as required by particular application, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with conduit size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
- B. Outlet and Device Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations.
  - 1. Plaster rings and device mounting rings shall be of proper depth such that the device mounting surface is flush with the finished wall/ceiling surface.
- C. Outlet and Device Boxes (damp and wet locations): Provide corrosion resistant cast metal raintight outlet and wiring device boxes of types, shapes and sizes required for each application, including depth of boxes, with threaded conduit holes for fastening electrical conduit, and cast metal face plates. Where weatherproof devices are indicated, provide spring hinged watertight caps suitable configured for each application, including face plate gaskets and corrosion resistant plugs and fasteners.
- D. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suite each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- E. Bushings, Knockout Closures, and Locknuts: Provide corrosion resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- C. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.

- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Avoid installing boxes back-to-back in walls.
- F. Position recessed outlet boxes accurately to allow for surface finish thickness. Boxes shall be installed such that the device mounting surface is flush with the wall/ceiling finished surface.
- G. Set floor boxes level and flush with finish flooring material. Provide trim flange to match finish floor material.
- H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

3.2 GROUNDING:

- A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

END OF SECTION 260535

## SECTION 260548 - SEISMIC SUPPORT OF ELECTRICAL EQUIPMENT

### PART 1 - GENERAL REQUIREMENTS

#### 1.1 SCOPE OF WORK:

##### A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of seismic support of electrical equipment systems and appurtenances where shown on the drawings and specified hereinafter.

#### 1.2 RELATED WORK/SECTIONS:

- ##### A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:

1. Division 1
2. All other Division 26 sections
3. All Division 27 and 28 sections

#### 1.3 QUALITY ASSURANCE:

##### A. Codes and Standards:

1. All seismic equipment and design shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

- a. South Carolina Building Code (SCBC 2018)

- ##### B. Seismic control equipment shall be sized and provided by manufacturer. Seismic bracing shall be a factory manufactured item listed in the manufacturers catalog for the intended use.

##### C. Manufacturer:

1. The seismic control supports manufacturers shall be as manufactured by one of the following or approved equal:

- a. Mason Industries
- b. Amber Booth
- c. Peabody

1.4 SUBMITTALS:

- A. The manufacturer shall submit drawings including floor plans, sections and elevations showing piping, duct, and equipment. Drawings shall indicate location and type of all components provided.
- B. A schedule shall show capacity and load of each component at each location.
- C. Design shall be based upon actual installation and not contract drawing schematics.
- D. Submittals shall include:
  - 1. Sketches showing seismic loading, location of bracing and types and sizes of bracing assemblies.
  - 2. Submit seismic protection ratings in three principle axes certified by an independent laboratory.
  - 3. Submit calculations for shear, pull-up, primary overturning, and secondary overturning.
  - 4. Submit drawings indicating auxiliary supports and method of attachment.
  - 5. Calculations shall be submitted and signed by a licensed professional engineer.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. All equipment and applicable conduit shall be mounted on or suspended from approved foundations and supports as specified herein and as shown on the drawings.
- B. Steel components shall be phosphated and painted. All nuts, bolts, and washers shall be zinc-electroplated.

2.2 BRACING HANGERS:

- A. Seismic bracing shall be a factory manufactured item listed in the manufacturers catalog for the intended use.
- B. Equipment sway bracing shall be provided for all items supported by off-the-floor structures or structures suspended from floors or roof above.
  - 1. Braces shall consist of angles, rods, bars, or pipes run at 45% angles from the equipment frame to the building structure secured at both ends with bolts 1/2" or larger.
  - 2. Bracing shall be provided in two planes of direction, 90 degrees apart, for each item of equipment.

### 2.3 ELECTRICAL EQUIPMENT:

- A. Systems include but are not limited to the following:
  - 1. Electrical conduit 2-1/2" inside trade diameter or greater
  - 2. Panelboards
  - 3. Lighting fixtures:
    - a. Lighting fixtures installed in suspended ceiling systems shall conform to the guidelines of Cisca.
    - b. Recessed lighting fixtures shall be independently supported from the structure. The suspended ceiling system shall not be used to support the fixtures.
    - c. Surface mounted fixtures shall be attached to the ceiling system with positive clamping devices that completely surround the ceiling members. Safety devices shall be attached between the clamping device and the adjacent ceiling hanger or to the structure above.
    - d. Pendant hung lighting fixtures shall be supported directly from the structure above using No. 9 gauge wire without using the ceiling suspension system for direct support.
- B. Electrical conduit of any size suspended by individual hangers of less than 12 inches from top of conduit to the supporting structure, do not have to be seismically braced.
- C. Slab or floor mounted equipment not subject to movement or vibration.
  - 1. Equipment shall be direct anchored.
- D. Roof Mounted Equipment:
  - 1. Equipment shall be direct anchored.
  - 2. Curbs and equipment supports shall be attached to roof structure.

### 2.4 SEISMIC ACCESSORIES:

- A. Provide all necessary brackets, bolts, fasteners, predrilled bases, oversized bases, accessory components and materials to install systems in accordance with manufacturer's requirements.

### PART 3 - EXECUTION

#### 3.1 GENERAL:

- A. If the equipment to be mounted is not furnished with integral structural frames and external mounting lugs (both of suitable strength and rigidity), approved structural subbase shall be installed in the field which shall support the equipment to be hung and to which shall be attached the hangers.

#### 3.2 SUPERVISION:

- A. The manufacturer, or his qualified representative, shall be responsible for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation, the manufacturer, or his representative, shall make a final inspection and submit his report to the Architects and Engineers in writing certifying the correctness of installation and compliance with approved submittal data.

END OF SECTION 260548

## SECTION 26 2416 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. This section includes the furnishing and installation, at locations shown on the drawings, of approved panelboards of a type indicated and specified herein.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections

#### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in the NEC, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NEC.
- F. Panelboards shall comply with UL 67.
- G. Cabinet and boxes shall comply with UL 50.

#### 1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

C. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Service Conditions: NEMA PB 1.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- C. Coordinate circuit breakers and fused switch sizes for branch circuit and feeders serving equipment furnished by other trades of work prior to submitting panelboard shop drawings. Note overcurrent protection size adjustments in panelboard submittals.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Keys: Two spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 LABELING:

- A. All panels shall be UL labeled.
- B. All panels used as a service entrance, shall be labeled as such.
- C. A nameplate shall be provided listing panel type and ratings.

2.2 GENERAL PANELBOARD CONSTRUCTION:

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.



- B. Distribution, Lighting, and Appliance Panelboards: Provide dead-front safety constructed factory assembled circuit breaker type panelboards in sizes and ratings as indicated. Construct with rectangular shaped copper or tin plated aluminum bus bars which are securely mounted and braced, and with lugs bolted to main bus bars.
- C. Provide anti-turn solderless pressure type lug connectors approved for copper conductors, and construct unit for connecting feeders at top of panel.
- D. Equip with full-sized neutral bus bar with suitable lugs for circuits requiring neutral connection. Provide suitable lugs on neutral bus for each outgoing feeder required.
- E. Provide main and branch circuit breakers. Breakers shall be molded case bolt-in type, heavy-duty, quick-make, quick-break, with toggle handles that indicate when tripped. Where multipole breakers are indicated, provide with common trip so that overload on one pole will trip all poles simultaneously.
  - 1. Circuit breakers for branch circuit panelboards and circuit breakers 125A and smaller for distribution panelboards shall be thermal-magnetic type.
  - 2. Circuit breakers 150A through 800A for distribution panelboards shall be solid state trip LSI type, 80% rated.
  - 3. Circuit breakers 1000A and larger for distribution panelboards shall be solid state trip LSIG type, 100% rated.
- F. Provide bare uninsulated grounding bars suitable for bolting to enclosures.
- G. Load center type panelboards are not acceptable, unless specifically called for in drawings.
- H. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness, with baked gray enamel finish over a rust inhibitor coating. Construct with multiple knockouts and wiring gutters. All panelboard locks shall be keyed alike. Door hinges shall be piano hinges. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed. Equip with interior circuit-directory frame, and card with clear plastic covering.
  - 1. Surface mounted panelboard fronts shall be door-in-door type, with locks and keys for both inner and outer doors.
  - 2. Flush mounted panelboard fronts shall be hinged front type, with lock for inner door and screw fasteners for outer door.
- I. Panelboard Accessories: Provide panelboard accessories and devices including, but not limited to circuit breakers and fuses as recommended by panelboard manufacturer for ratings and applications indicated.
- J. Panelboards shall be shown in the following schedule, or approved equal, and shall be completely factory assembled. Do not purchase panelboards or cabinets until shop drawings have been approved.

1. Branch Circuit Panelboards (120/208 or 120/240 V Operation). Minimum cabinet width shall be 20":

Square D (BOD)	NQ
General Electric	AQ
Eaton	PRL1a
Siemens	P1

2. Distribution Panelboards:

Square D (BOD)	I-Line
General Electric	ReliaGear neXT
Eaton	PRL4
Siemens	P4/P5

- K. Where a specific interrupting rating is shown on the drawings, panelboards and associated circuit breakers shall be fully rated for that value as a minimum. Series rating of equipment is not acceptable.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF PANELBOARDS:

- A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A.
- D. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- E. Provide properly wired electrical connections within enclosures.
- F. Fill out panelboard's circuit directory card upon completion of installation work. Type text, handwriting is not acceptable. Directory shall reflect actual installation configuration and shall incorporate final room numbers. Room numbers shown on architectural plans shall not be used for the directory.

- G. Installation shall comply with the NEC.
- H. Anchor to walls per manufacturer's recommendation.
- I. Lace all feeder cables with tie wraps in panel housing. All wiring shall be run square inside housing.
- J. Vacuum panel housing to remove all dust and dirt from housing prior to final inspection.
- K. Cover panel housing prior to room painting. Clean all paint from panel.
- L. Provide engraved plastic identification label black face with white lettering, indicating panelboard name, voltage system, and upstream distribution including room name and number. Attach identification labels to panel with rivets or sheet metal screws.
  - 1. Labels for panels fed from the emergency power system shall have red faces with white lettering.

### 3.2 GROUNDING:

- A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Stds. 486A to assure permanent and effective grounds.

### 3.3 FIELD QUALITY CONTROL:

- A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check panelboards for electrical continuity of circuits, and for short circuits.
- D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units and then retest to demonstrate compliance.

END OF SECTION 26 2416

## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of wiring devices as shown on the plans.
- B. Types of electrical wiring devices in this section include the following:
  - 1. Receptacles
  - 2. Switches
  - 3. Faceplates
  - 4. Motor rated toggle switches

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1.
  - 2. Other Division 26000 sections.
- B. See section on Substitutions.

#### 1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.

#### 1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 26 0500, ELECTRICAL GENERAL REQUIREMENTS.
- B. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- C. The specific item proposed and its area of application shall be marked on the catalog cuts.

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES:

- A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub. No. WD 1 and meet UL/Federal Spec WC-596.
- B. Wiring Devices: 15 and 20A, 120 V devices shall employ modular connections without exposed wiring terminals. Acceptable products are as follows.
  - 1. Legrand/P&S Plugtail
  - 2. Hubbell SnapConnect
  - 3. Leviton Lev-Lok
- C. Color of wiring devices shall be as selected by Architect.
- D. Wiring devices shall be as listed in the following table, or approved equal:

<u>Description</u>	<u>Legrand</u>	<u>Hubbell</u>	<u>Leviton</u>
Single Pole Toggle Switch	PT20AC1	SNAP1221	M1221
Three Way Toggle Switch	PT20AC3	SNAP1223	M1223
20A 125V 2P 3W Grounded Duplex Receptacle (NEMA 5-20R)	PTTR5362A	SNAP5362A	M5362
20A 125V 2P 3W Grounded Duplex Ground Fault Interrupter (NEMA 5-20R)	PT2097TR	GFRST20SNAP	MGFT2
20A 125V 2P 3W Grounded Duplex Ground Fault Interrupter Weather Resistant (NEMA 5-20R)	2097TRWR	GFWRST20	G5362-WTT
20A 250V 2P 3W Grounded Single Receptacle (NEMA 6-20R)	5871	HBL5461	5461

<u>Description</u>	<u>Legrand</u>	<u>Hubbell</u>	<u>Leviton</u>
30A, 208/120V 3P 4W Dryer Receptacle (NEMA 14-30R)	3864	HBL9430A	278
50A, 208/120V 3P 4W Range Receptacle (NEMA 14-50R)	3894	HBL9450A	279
30A, 600V 2P Motor Rated Toggle Switch	7802MD	HBL7832D	MS302-DS

2.2 WET AND DAMP LOCATION RECEPTACLES:

- A. Type "DL" - Damp Locations: Damp location receptacles shall be duplex GFI receptacles similar to those under 262726 WIRING DEVICES, Part 2.1.B, mounted in cast metal outlet box fitted with a gasketed metal cover with spring door. Damp location receptacles shall be flush mounted unless noted otherwise. Wiring device utilized shall be listed weather resistant per NEC.
- B. Type "WP" - Wet Locations: Weatherproof receptacles shall be duplex GFI receptacles as specified under 262726 WIRING DEVICES, Part 2.1.B, mounted in cast metal outlet box fitted with a gasketed "while-in-use" metal cover, Hubbell WP26E or Pass & Seymour WIUC10-CAGV or approved equal. Weatherproof receptacles shall be flush mounted in exterior walls. Wiring device utilized shall be listed weather resistant per NEC.

2.3 DEVICE PLATES:

- A. Outlet boxes shall have a coverplate.
- B. Unused telephone outlets shall be fitted with a blank cover plate.
- C. Faceplates: Provide faceplates for single and combination wiring devices, of types, sizes, and with ganging cutouts as indicated. Select plates which mate and match wiring devices to which attached. Metal screws shall be used for securing plates to devices; screw heads colored to match finish of plates.
- D. Faceplates shall be uniform in design and finish for switches, receptacles, and other outlets. Plates shall be one-piece of the required number of gangs; sectional plates shall not be used.
- E. Plates shall be jumbo oversize satin finished stainless steel.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF WIRING DEVICES:

- A. Install wiring devices as indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
- D. The devices shall be installed in such a manor as to allow the faceplates to be installed without distortion of the faceplate or gaps between the faceplate and wall.
- E. Install faceplates after painting work is completed.
- F. Unless otherwise specified, install faceplates on all device and outlet boxes including telephone outlet boxes. As a minimum, blank plates shall be included for 25% of telephone/data outlets shown on the drawings.
- G. Tighten connector and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A. Use properly scaled torque indicating hand tool.

#### 3.2 PROTECTION OF FACEPLATES AND RECEPTACLES:

- A. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

#### 3.3 GROUNDING:

- A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounds.

#### 3.4 TESTING:

- A. Prior to energizing circuitry, test wiring for electrical continuity, and for short circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 262726

## SECTION 262816 - SAFETY/DISCONNECT SWITCHES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. This section includes the furnishing, installation, connection, and wiring of safety switches.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections
- B. See section on Substitutions.

#### 1.3 QUALITY ASSURANCE:

- A. Safety/Disconnect switches shall conform to Underwriter's Laboratories UL 98, "Enclosed and Dead-Front Switches."

#### 1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.

### PART 2 - PRODUCTS

#### 2.1 GENERAL SAFETY/DISCONNECT SWITCH FEATURES:

- A. Furnish and install safety/disconnect switches as indicated on the plans and specifications.
- B. Switches shall be NEMA type HD (Heavy Duty) and UL listed.
- C. All switches shall have switch blades which are fully visible in the "OFF" position when the switch door is open. All current carrying parts shall be plated to resist corrosion and promote cool operation. Switches shall have removable arc suppressors where necessary to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 60 degrees C and 75 degrees C, aluminum or copper wires.
- D. Switches shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The operating handle shall be an integral part of the box, not the cover. Provisions for padlocking the switch in the "OFF" position with at least three locks shall be provided.



Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door when the handle is in the "ON" position, and to prevent closing of the switch mechanism with the door open. The handle position shall indicate whether the switch is "ON" or "OFF".

- E. Switches shall be horsepower rated for AC and/or DC as indicated by the plans. All fusible switches rated 100 thru 600 amperes at 240 volts and 30 thru 600 amperes at 600 volts shall have a UL approved method of field conversion from standard Class H fuse spacing to Class J fuse spacing. The switch also must accept Class R fuses and have provisions for field installation of a UL listed rejection feature to reject all fuses except Class R. The UL listed short circuit rating of the switches shall be 200,000 rms symmetrical amperes when Class R or Class J fuses are used with the appropriate rejection scheme. The UL listed short circuit rating of the switch, when equipped with Class H fuses, shall be 10,000 rms symmetrical amperes. 800 and 1200 ampere switches shall have provisions for Class L fuses and shall have a UL listed short circuit rating of 200,000 rms symmetrical amperes.
- F. Disconnect switches shall be equipped with ground lug.

## 2.2 NEMA 1 AND 3R HEAVY DUTY SAFETY/DISCONNECT SWITCHES:

- A. Switches shall be furnished in NEMA 1 general purpose enclosures unless exposed to weather which shall be NEMA 3R. Covers on NEMA 1 enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position. NEMA 3R enclosures for switches thru 200 amperes shall have provisions for interchangeable bolt-on hubs. Hubs shall be as indicated on the plans. NEMA 3R enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel.
- B. Switches shall comply with paragraph 2.01 of this section.

## 2.3 NEMA 4X HEAVY DUTY SAFETY/DISCONNECT SWITCHES:

- A. Provide NEMA 4X disconnect switches where indicated on the drawings.

## 2.4 SPECIFIED MANUFACTURERS:

- A. Specified manufacturers shall be as follows, or approved equal:
  - 1. General Electric
  - 2. Square D
  - 3. Siemens
  - 4. Eaton

PART 3 - EXECUTION

3.1 INSTALLATION LOCATION:

- A. As a general rule, install switches on the equipment it serves, if shown that way on the drawings.
- B. Do not install switch on equipment removable panel.
- C. All switches shall be accessible.

3.2 GROUNDING:

- A. Connect ground wires to ground lug.
- B. See section - GROUNDING.

3.3 CONDUIT BUSHINGS:

- A. Use plastic bushings where conduit enters switch.

END OF SECTION 262816

## SECTION 264313 – SURGE-PROTECTIVE DEVICES

### PART 1 - GENERAL

#### 1.1 SCOPE:

- A. Work under this section consists of furnishing all materials necessary for the execution and complete installation of transient voltage surge suppressors.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specifications sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26 sections
- B. See section on Substitutions.

#### 1.3 DEFINITIONS:

- A. SPD: Surge-Protective Device
- B. VPR: Voltage Protection Rating
- C. SCCR: Short Circuit Current Rating
- D. MCOV: Maximum Continuous Operating Voltage
- E. I-n: Nominal discharge current rating

#### 1.4 REFERENCE STANDARDS:

- A. UL 1449 – 3<sup>RD</sup> edition.
- B. UL 96A
- C. IEEE Standard C62.45-2002
- D. IEEE Standards C62.41.1-2002, C62.41.2-2002
- E. National Electrical Manufacturer's Association Guidelines (NEMA LS1-1992)
- F. NEC Article 285
- G. NFPA 780

1.5 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with division 26 specification "ELECTRICAL COORDINATION".
- B. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- C. The specific item proposed and its area of application shall be marked on the catalog cuts.
- D. Installation instructions for each SPD type submitted.
- E. Submittals shall include UL 1449 3<sup>rd</sup> edition Listing documentation verifying the following:
  - 1. SCCR
  - 2. VPR for all modes
  - 3. MCOV rating
  - 4. I-n
- F. Warranty documentation.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Units shall consist of parallel connections.
- B. Suppression components: Metal Oxide Varistors (MOVs) shall be utilized as the primary suppression components.
- C. Enclosures:
  - 1. Units located in indoor environments shall be provided in heavy duty NEMA 12 or better rated enclosure.
  - 2. Units located in outdoor environments shall be provided in heavy duty NEMA 4X enclosures.
  - 3. Refer to the drawings to determine whether units are for indoor or outdoor applications.
- D. Diagnostics and monitoring: All units shall be provided with the following for alarm annunciation and remote monitoring:
  - 1. Active indicator lamps which shall extinguish or change color when protection has failed.

2. One or more sets of form "C" dry contacts for auxiliary alarm monitoring.
    - a. Minimum contact ratings: 100VA at 220VAC/150VDC.
  3. Audible annunciator with alarm silence switch.
- E. Internal mode fusing
1. Each SPD mode shall be fused with a 200 kAIR, UL recognized surge rated fuse and incorporate a thermal cutout device.
  2. SPD shall safely reach an end-of-life condition when subjected to fault current levels between 0 and 200 kA, including intermediate level fault currents from 10 to 1000 amperes per UL 1449 Abnormal Overvoltage testing.
- F. All units shall have a 10 year unconditional warranty.
- G. See PART 3 - EXECUTION for additional requirements.

## 2.2 ACCEPTABLE MANUFACTURERS:

- A. Basis of design is Square D Surgelogic types IMA, EMA and HWA SPD's. Except where specifically noted otherwise within this specification SPD's provided shall match or exceeding the performance of the basis of design shall be manufactured by one of the following:
1. All manufacturers approved under division 26 specifications "PANELBOARDS".

## 2.3 TYPE L1 UNIT:

- A. The L1 device shall be a standard product of the panelboard manufacturer and shall be contained within the panelboard enclosure. All device status indicator lamps shall be visible without removing panelboard covers.
- B. Device shall be of modular design utilizing discrete replaceable modules for each mode of protection.
- C. Device type: Type 1 or type 2 SPD
- D. Minimum modes of protection: L-N, L-G & N-G
- E. Device shall be suitable for use on 208/120V 3-phase 4-wire systems. Maximum acceptable VPR:
1. 700V L-N, L-G, N-G
  2. 1200V L-L
  3. I-n: 20,000A
- F. Minimum acceptable single pulse surge current capacity: 400,000A per phase

2.4 Type L2 unit:

- A. The L2 device shall be a standard product of the panelboard manufacturer and shall be contained within the panelboard enclosure. All device status indicator lamps shall be visible without removing panelboard covers.
- B. Device type: Type 1 or type 2 SPD.
- C. Minimum modes of protection: L-N, L-G & N-G
- D. Device shall be suitable for use on 120/208V, 3-phase, 4-wire systems. Maximum acceptable VPR:
  - 1. 700V L-N, L-G, N-G
  - 2. 1200V L-L
  - 3. I-n: 20,000A
- E. Minimum acceptable single pulse surge current capacity: 160,000A per phase

2.5 TYPE L3 UNIT:

- A. The L3 device shall be a standard product of the panelboard manufacturer and shall be contained within the panelboard enclosure. All device status indicator lamps shall be visible without removing panelboard covers.
- B. Device type: Type 1 or type 2 SPD.
- C. Minimum modes of protection: L-N, L-G & N-G
- D. Device shall be suitable for use on 120/208V, 3-phase, 4-wire systems. Maximum acceptable VPR:
  - 1. 700V L-N, L-G, N-G
  - 2. 1200V L-L
  - 3. I-n: 20,000A
- E. Minimum acceptable single pulse surge current capacity: 80,000A per phase

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. The unit shall be installed in accordance with the manufacturer's printed instruction. All local and national codes must be observed.
- B. Units shall be installed of the same voltage rating as the intended protected equipment.

3.2 LOCATIONS:

- A. See the power riser diagrams and panelboard schedules for SPD locations and types to be provided.

END OF SECTION 264313

## SECTION 265100 - LIGHTING

### PART 1 - GENERAL

#### 1.1 SCOPE:

- A. This section included the furnishing, installation, and connection of light fixtures, conduit, lamps, fittings, and boxes to form complete, coordinated, grounded interior lighting systems.

#### 1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:
  - 1. Division 1
  - 2. All other Division 26000 sections

#### 1.3 QUALITY ASSURANCE:

- A. NEC Compliance: Comply with NEC as applicable to installation and construction of lighting fixtures.
- B. UL Compliance: Provide lighting fixtures which have been UL listed.
- C. CBM Labels: Provide fluorescent lamp ballasts which comply with certified Ballast Manufacturers Association standards and carry the CBM label.

#### 1.4 SUBMITTALS:

- A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260500, ELECTRICAL GENERAL REQUIREMENTS.

#### 1.5 COORDINATION OF CEILING TYPE:

- A. Determine the exact ceiling to be furnished in each area and obtain fixtures to suit. Deviate from specifications only where necessary and to the extent necessary to ensure fixture-ceiling compatibility.

### PART 2 - PRODUCTS

#### 2.1 LIGHTING FIXTURES - GENERAL:

- A. Shall conform to the drawings and fixture schedule.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, and as shown on the drawings.



- B. Align, mount, and level the lighting fixtures uniformly.
- C. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.
- D. Use earthquake clips on all fixtures.
- E. Support fixtures securely from building structure. Grid ceiling framing members shall not be used to support fixtures.

3.2 CLEAN-UP:

- A. Before final acceptance of the electrical work in all or any part of the building, the Contractor shall clean the bottoms, the trim, the reflecting surfaces, lenses, baffles, reflector cones and lamps of all lighting fixtures.
- B. Mask the trim and bottoms of all lighting fixtures if necessary to protect the fixture during construction.

END OF SECTION 265100

SECTION 270500 - CONDUIT FOR TECHNOLOGY AND COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE:

- A. This section includes the furnishing, installation, and connection of conduit and raceway systems for the Owner's technology and communication systems.

1.2 RELATED WORK/SECTIONS:

- A. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included.

PART 2 - PRODUCTS:

2.1 GENERAL:

- A. Refer to section 26 0533 of this specification for materials requirements of conduit systems.

PART 3 - EXECUTION:

3.1 GENERAL:

- A. Refer to section 26 0533 of this specification for installation requirements of conduit systems.
- B. All empty conduit shall be provided with nylon pullstring.
- C. All unused outlets shall be equipped with blank coverplates.

END OF SECTION 270500

## SECTION 323113 - CHAIN LINK FENCES AND GATES

### 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. Chain-link fences.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - a. Fence and gate posts, rails, and fittings.
  - b. Chain-link fabric, reinforcements, and attachments.
  - c. Gates and hardware.

- B. Shop Drawings: For each type of fence and gate assembly.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Include accessories, hardware, gate operation, and operational clearances.

- C. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of chain-link fence, and gate.

- B. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by a qualified testing agency.

- C. Field quality-control reports.

- D. Sample Warranty: For special warranty.

## 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## 1.6 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to comply with performance requirements.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.
- B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

### 2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
  - 1. Fabric Height: As indicated on Drawings.
  - 2. Steel Wire for Fabric: Wire diameter of 0.148 inch (3.76 mm).
    - a. Mesh Size: 2 inches (50 mm).

### 2.3 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:

1. Fence Height: As indicated on Drawings.
2. Horizontal Framework Members: top and bottom rails according to ASTM F1043.
3. Metallic Coating for Steel Framework:
  - a. Type A: Not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating according to ASTM A653/A653M.
  - b. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
  - c. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc-pigmented coating.
  - d. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
  - e. Coatings: Any coating above.

## 2.4 SWING GATES

- A. General: ASTM F900 for gate posts and double swing gate types.
  1. Gate Leaf Width: As indicated.
  2. Framework Member Sizes and Strength: Based on gate fabric height of 72 inches (1830 mm) or less.
- B. Pipe and Tubing:
  1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
  2. Gate Posts: Round tubular steel.
  3. Gate Frames and Bracing: Round tubular steel.
- C. Frame Corner Construction: Welded or assembled with corner fittings.
- D. Hardware:
  1. Hinges: 180-degree outward swing.
  2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
  3. Lock: Manufacturer's standard internal device.

## 2.5 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.
  - C. Rail and Brace Ends: For each gate, corner, pull, and end post.
  - D. Rail Fittings: Provide the following:
    1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than **6 inches (152 mm)** long.
    2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails to posts.
  - E. Tension and Brace Bands: Pressed steel.
  - F. Tension Bars: Steel, length not less than **2 inches (50 mm)** shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
  - G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
  - H. Tie Wires, Clips, and Fasteners: According to ASTM F626.
    1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
      - a. Hot-Dip Galvanized Steel: **0.148-inch- (3.76-mm-)** diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
  - I. Finish:
    1. Metallic Coating for Pressed Steel or Cast Iron: Not less than **1.2 oz./sq. ft. (366 g/sq. m)** of zinc.
- 2.6 GROUT AND ANCHORING CEMENT
- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
  - B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts.

#### 3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
- B. Post Setting: Set posts in concrete or with mechanical anchors at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
    - a. Posts Set into Holes in Concrete: Form or core drill holes not less than **5 inches (127 mm)** deep and **3/4 inch (20 mm)** larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
- C. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings.
- D. Line Posts: Space line posts uniformly at **10 feet (3 m)** o.c.
- E. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- F. Intermediate and Bottom Rails: Secure to posts with fittings.
- G. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave **2-inch (50-mm)** bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

- H. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.
- I. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

### 3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

### 3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 323113